SOUTHERN CALIFORNIA ASSOCIATION OF GOVERNMENTS

2008
RTP REGIONAL TRANSPORTATION PLAN

Making the Connections

Integrated Growth Forecast and Regional Land Use Policies Report

DRAFT

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INTEGRATED GROWTH FORECAST AND REGIONAL LAND USE

Introduction

With a growing population, transportation infrastructure planning and technological innovations are essential to improving air quality as more people drive more often and trip lengths increase. However, these methods alone will not be enough to mitigate emissions. Through the integration of land use planning and transportation infrastructure investments, the following Chapter outlines land use strategies for development patterns that increase transportation options and encourage use alternate travel modes.

Using an integrated growth forecasting approach and consensus-built growth visioning process, SCAG developed growth policies that shape the RTP Plan Alternative in order to influence development patterns that reduce driving. The growth assumptions, vision and policies were all developed in coordination with technical analyses, local input, land use and growth experts, and on-the-ground "reality checks." The resulting Plan Alternative indicates that modified growth patterns based on these policies are modeled to show a direct positive impact on air quality in the region. SCAG's Compass Blueprint Program, in addition to legislative efforts, shapes the implementation plan for enacting these policies and programs through partnerships with and services offered to cities, counties, subregions and county transportation commissions to ensure these positive effects on air quality.

COMPASS BLUEPRINT GROWTH VISION

Beginning in 2000, SCAG initiated one of the first large-scale regional growth visioning efforts in the nation. Through its Compass Blueprint Growth Vision, SCAG sought to integrate land use and transportation through a consensus-built regional plan. The Vision was developed with the goal of accommodating the six million additional residents expected by 2030, while improving mobility for all residents, fostering livability in all communities, enabling prosperity for all people and promoting sustainability for future generations.

Widespread public participation was the cornerstone of the visioning process, with over 15,000 stakeholders taking part in dozens of workshops, focus groups and polls region-wide. Using the extensive input from these efforts, in conjunction with capacity, economic and redevelopment analyses, technical modeling analysis and expert peer review, SCAG established regional consensus toward the Compass Vision.

Driven by four guiding principles of mobility, livability, prosperity and sustainability, the Growth Vision provided a policy-based growth alternative, encouraging future population and economic growth in strategic opportunity areas thought the region. Specifically, the plan called for mixed use and transit-oriented development, a range of housing and transportation options, jobs-housing balance and more walkable communities in existing and planned centers and along transportation corridors. Using these growth strategies, subsequent analyses found that anticipated growth could be accommodated through modest changes to just 2% of the region that adopt these policy alternatives.

The Growth Vision alternative was approved and adopted by the Regional Council as the Plan Alternative for the 2004 Regional Transportation Plan. The policies at the foundation of the Alternative encourage changes to the urban form that improve accessibility to transit, and create more compact development, thereby yielding a number of transportation benefits to the region. These included reductions in travel time, vehicle miles traveled, vehicle hours traveled, and vehicle hours of delay. Concurrently, the Alternative yielded increased transit use and mode share. All of these effects lead to tangible air quality improvements.

Specifically, modeling analyses showed that the 2004 Growth Vision Alternative decreased average travel time for all trips by 7.5 percent, while the Baseline Alternative increased average travel time by 12 percent. The Growth Vision Alternative also showed improvements to vehicle miles traveled and vehicle hours traveled, with as much as 7 million vehicle miles and 1.87 million hours saved daily respectively, as compared to the Baseline. Similar benefits were found in the Plan Alternative, with a 42% reduction in vehicle hours of delay from the Baseline Alternative.

Also apparent were improvements to transit ridership and mode share as a result of the 2004 Plan Alternative. Daily transit boardings increased 24 percent over the Baseline Alternative, and 53 percent over then current (year 2000) levels. Mode share for commuting to work or school also improved, with a decrease in the rate of people driving alone from 76.7 percent to 73 percent, and an increase in the transit mode split of 54 percent. The 2004 Preferred Alternative outperformed the other scenarios due largely to the strategies and guidelines outlined in the Compass Growth Vision and incorporated into the transportation model.

These transportation model results, along with the other economic, social and environmental benefits garnered through the Vision, fueled a region-wide commitment to its implementation. Since 2005, SCAG and its local partners have worked toward implementing the shared regional vision through a variety of innovative tools and approaches collectively referred to as the "2% Strategy." Already, through the policies and planning efforts led by SCAG, a number of changes have been made to local development patterns throughout the region that will help to achieve the Plan's transportation benefits. The final section of this chapter provides a detailed description of the implementation program for pursuing the Growth Vision and its subsequent air quality benefits.

REGIONAL SETTING

Southern California is running out of land to support low density future growth. The ocean and mountains pose natural barriers to development. Environmentally sensitive areas hem in the region and dot the urbanized area, e.g. coastal wet lands and natural habitat areas. A significant amount of land is also owned by the state and federal government for the public benefit and is off limits to development.

Freeways provide access to farm land and grazing areas that could be used to accommodate future grow along the east - west axis of the region. There is little access to the north except through mountain passes that are choked with car and truck traffic. The centrifugal force of growth is still pushing the development footprint of the urbanized area outward. But dispersed development is being pushed back by natural barriers and financial constrains related to paying for needed infrastructure to support further outward expansion and public resistance to unsustainable "leap frog" growth into green fields and sensitive habitat areas. Nearly all natural locations for urban development have been consumed. What we are left with are hard choices about how we grow and change to meet the demands of the future.

Much of the urbanized area is fighting gridlock as 95% or more of the population drives back and forth to work and to accomplish the tasks of daily living, and another 3 to 5% take transit or walk. Growth management strategies and ballot initiatives are aimed at preserving and protecting prime farm and grazing land from residential development pressures, while preserving historic buildings, single family neighborhoods and prime industrial land for economic development. There are limits to both sprawling and infill development.

More and more there is a realization that as large as the region is in square miles, it is running out of developable land to support a significantly unbalanced auto oriented development pattern. There is an increasing need for reinvestment and higher densities near public transit, along corridors and in-town, mixed use urban centers. The blueprint for this growth vision has at its heart the notion that promotion of a more compact urban form for the region that uses existing infrastructure and preserves natural areas is important for sustaining a higher quality of life for all Southern Californians.

Southern California has the nation's largest bus ridership and an emerging metro, commuter and light rail transit network that provides a better balance of transportation choices that can reduce auto travel and support more pedestrian, mixed use and transit oriented development. This denser and more compact urban form is intended to put homes and jobs closer together so that commutes, fuel consumption, and vehicle miles traveled can be reduced, and green house gas emissions decreased, even as we continue to increase population, add employment and grow sustainably.

THE SHAPE AND PATTERN OF FUTURE GROWTH

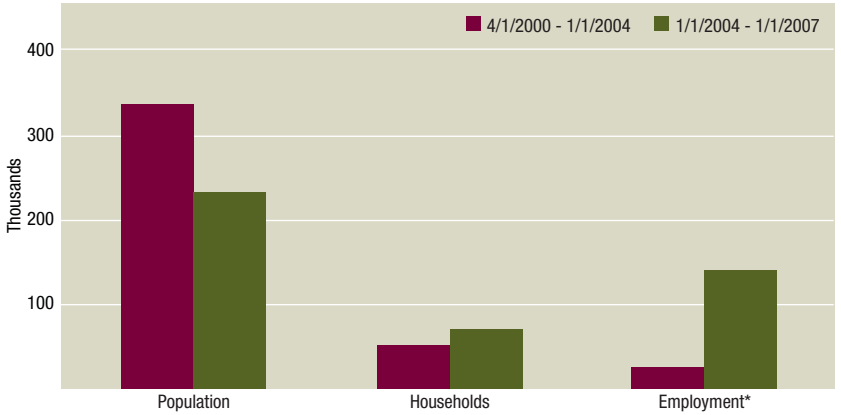
This section describes the population, employment, and demographic changes that happened in the recent past and may be expected in the SCAG region over the next 30 years without a change in regional policy. These demographic and economic changes are an integral part of planning the transportation system to ensure that the users' needs are addressed.

POPULATION GROWTH

The SCAG region is the second most populated metropolitan area in the United States. Nearly one-half of all Californians live in the SCAG region and 1 in 17 people living in the entire United States reside here. By July 1, 2007, the region's population had reached 18.6 million residents, having grown by 2 million residents (12 percent) from 16.6 million people just seven years ago. The population growth (2 million residents) of the SCAG region between 2000 and 2007 was higher than the population growth (1.9 million residents) that occurred throughout the 1990s.

Figure 1 shows the growth pattern of population, households, and employment between 2000 and 2007. Population growth slows down in the middle 2000s (2004-2007), while both household and employment growth are much faster in the middle 2000s than in the early 2000s.

FIGURE 1 ANNUAL AVERAGE GROWTH OF POPULATION, EMPLOYMENT, AND HOUSEHOLDS, 2000-2004 AND 2004-2007

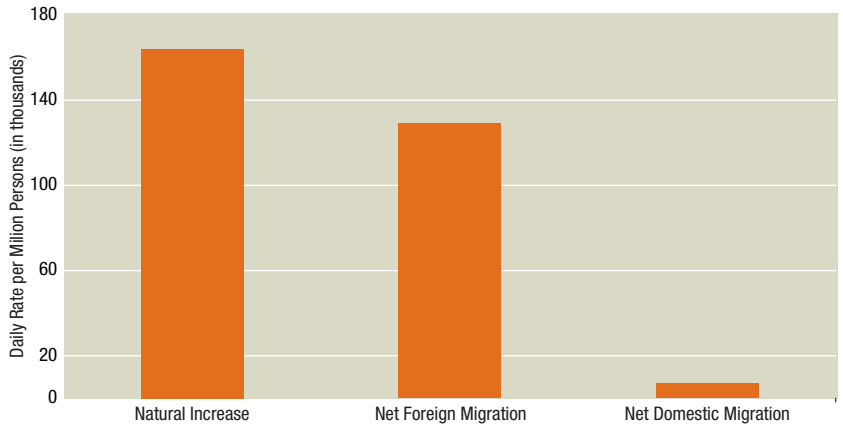


Source: CA Department of Finance, CA Employment Development Department, SCAG Employment Estimates

Two major sources of population growth since 2000 are natural increase (births minus deaths) and net foreign immigration (people who move here from foreign countries minus those who move away to foreign countries). Natural increase accounted for 55 percent of the population gain in the region. Although the total fertility rate of women of child bearing ages remains stable in recent years, Hispanic women still maintain a relatively higher total fertility rate. The life expectancy of Southern California residents increased while the death rate decreased.

Net foreign immigration, mostly from Mexico, Central America, and Asia, accounted for 43 percent of the population gain in the region. Foreign immigration, including unauthorized immigrants, was not affected by the region's economic cycle. Southern California is still an attractive destination as a gateway for new immigrants, although international migration to the region has leveled off in recent years.

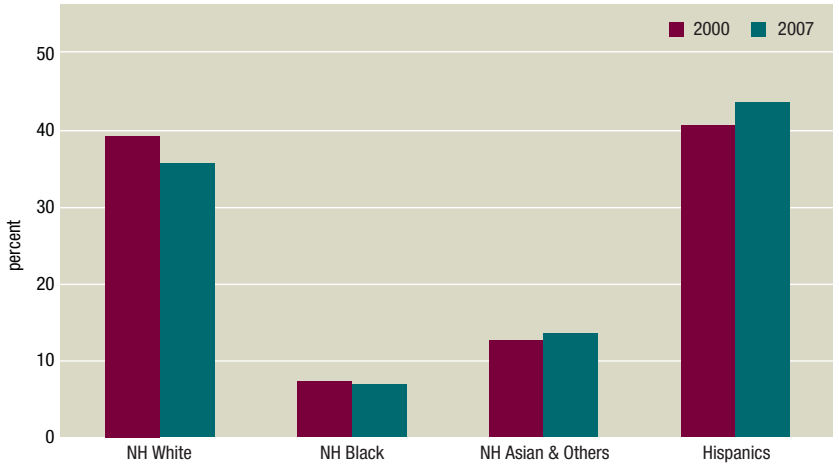
FIGURE 2 COMPONENTS OF ANNUAL POPULATION GROWTH, 2000-2006



Source: CA Department of Finance

As of July 1, 2007, there is no racial or ethnic majority in the region. Hispanics comprises 44 percent of the region's population, followed by Non-Hispanic (NH) Whites at 36 percent, NH Asians and Others at 13 percent, and NH Blacks at 7 percent. Compared to the 2000, Hispanics increased its share of the population by 3 percent, while NH Whites decreased its share by the same percentage. There is little change in the share of other race/ethnic groups between 2000 and 2007. The region is moving toward an Hispanic majority.

FIGURE 3 ETHNIC COMPOSITION OF POPULATION, 2000 AND 2007



Source: CA Department of Finance

The region shows an aging pattern of population growth between 2000 an 2007. According to California Department of Finance (DOF) estimates, nearly 80 percent of population growth occurs in the age group of 36 years old or more. Age groups of 4-10 years old and 27-35 years old decline by 6 percent and 8 percent, respectively, over the same period. The absolute decline of school age children and younger adults raises a concern about future school construction needs and labor force in younger workers.

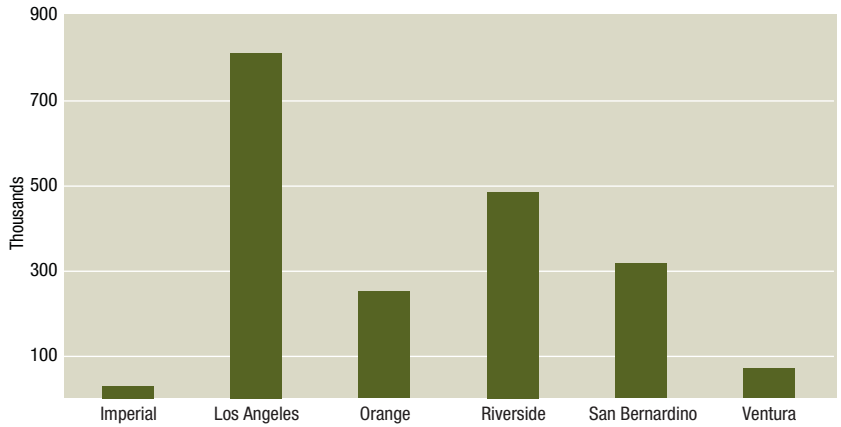
TABLE 1 AGE COMPOSITION OF POPULATION, 2000 AND 2007

Age	7/1/2000	7/1/2007	Change	%Change
0-3	1,017,000	1,078,000	62,000	6%
4-10	1,977,000	1,868,000	(109,000)	-6%
11-26	3,885,000	4,528,000	642,000	14%
27-35	2,413,000	2,227,000	(187,000)	-8%
36+	7,333,000	8,860,000	1,526,000	17%
Total	16,262,000	18,560,000	1,934,000	12%

Source: CA Department of Finance

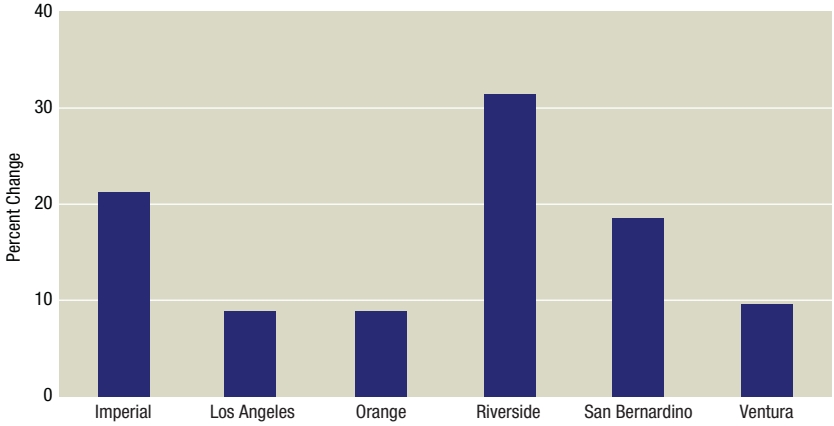
The Inland Empire and Imperial Valley are the fastest growing areas in the region. Los Angeles County accounted for 41 percent of the region's growth over the last seven years (813,000), Riverside and San Bernardino Counties added 804,000 residents. In terms of relative growth, Los Angeles and Orange Counties were the slowest growing counties, adding only 9 percent each to its population during the same period while Riverside County grew by 40 percent. San Bernardino Country grew by 19 percent and Imperial County grew by 22 percent. Nearly 46 percent of the region's growth occurred in areas outside of Los Angeles and Orange Counties.

FIGURE 4 POPULATION GROWTH BY COUNTY, 2000-2007



Source: CA Department of Finance

FIGURE 5 PERCENT CHANGE OF POPULATION BY COUNTY, 2000-2007



Source: CA Department of Finance

HOUSEHOLD GROWTH

Since the 2000 US Census, there was a net addition of 410,000 households bringing the regional total to nearly 5.8 million in 2007. However, population growth outpaced household growth with only one household for every five persons added. The rapidly growing population is reflected in larger households rather than in the formation of new households. The average persons-per-household ratio in the region has increased from 3.07 in 2000 to 3.19 in 2007. The increasing household size may be caused by the cultural propensity of some groups such as recent immigrants to form the large intergenerational families or by the limited supply of affordable housing units. Workforce housing affordability and availability issues have affected quality of life in the region. The insufficient supply of affordable housing in jobs-rich urban areas supported existing trends in urban sprawl, longer commute patterns, congested freeways and worsening air quality.

EMPLOYMENT GROWTH

In 2006, the region's total employment including self-employment is estimated to be nearly 8 million, having grown by 500,000 jobs (7 percent) from 7.5 million just six years ago. The region's economy is robust in terms of the number and the type of jobs available to residents looking for jobs. The unemployment rate of the region is at its historically lowest at 4.6 percent in 2006. The previous record in the region was 5 percent in 2000. The region's employment has been steadily growing since the recession of the early 1990s. The region experienced a net loss of 500,000 jobs during the recession period between 1990 and 1993. The region overcame the recession by adding net 780,000 jobs between 1996 and 2000. After slow growth in jobs in 2002 and 2003, the region is regaining its economic strength by increasing new annual job growth beyond these early decade levels.

The overall pattern of employment change is driven by the decline in manufacturing sector jobs due to globalization. Between 2000 and 2006, the manufacturing sector jobs dropped from 1 million jobs to 835,000 jobs, a loss of 188,000 jobs. The share of the manufacturing sector jobs declined by 3 percent. Other significant economic sectors experiencing the absolute loss of jobs include 1) information, 2) agriculture and mining, and 3) transportation and warehousing, and utility. In contrast, 1) construction, 2) financial activity, 3) leisure and hospitality, 4) retail trade, and 5) other service sectors added a significant amount of additional jobs to the regional economy. The growth of construction and financial activity sectors was caused by the strong residential housing development. The increases in some service sector jobs are directly associated with the increase in total population and an increase in the aged population in the region. The growth of service sectors, in particular, population serving jobs, is likely to continue in the future.

The strong regional job growth directly influences domestic migration because it induces more domestic in-migration than domestic out-migration, while the weak job growth causes more domestic out-migration than domestic in-migration. More net in-migration influences the job growth in the "population-serving" retail and service sectors.

TABLE 2 EMPLOYMENT BY SECTOR, 2000 AND 2005

Sectors (NAICS)	2000		2005		Change		
	Number	%	Number	%	Number	% Change	Change in %
Agriculture & Mining	84,000	1%	78000	1%	(6,000)	-7%	0%
Construction	369,000	5%	465000	6%	96,000	26%	1%
Manufacturing	1,023,000	14%	835,000	11%	(188,000)	-18%	-3%
Wholesale Trade	374,000	5%	386,000	5%	12,000	3%	0%
Retail Trade	770,000	10%	841,000	11%	71,000	9%	1%
Transportation and Warehousing, and Utility	354,000	5%	349,000	4%	(5,000)	-1%	0%
Information	324,000	4%	278,000	4%	(46,000)	-14%	-1%
Financial Activities	415,000	6%	504,000	6%	89,000	21%	1%
Professional and Business Services	1,167,000	16%	1,197,000	15%	30,000	3%	0%
Education and Health Services	1,429,000	19%	1,546,000	20%	117,000	8%	1%
Leisure and Hospitality	664,000	9%	746,000	10%	82,000	12%	1%
Other Services	293,000	4%	313,000	4%	20,000	7%	0%
Public Administration	217,000	3%	234,000	3%	17,000	8%	0%
Total	7,482,000	100%	7,771,000	100%	289,000	4%	**0%**

Source: CA Employment Development Department, SCAG Employment Estimates

INCOME

Income is one of most important indicators of economic well-being of residents in the region. In 1999, per capita income of the region, as a measure of the wealth of the residents, is approximately $21,000. By 2006, this amount had grown to $25,000, an increase of 20 percent. After adjusting for inflation, per capita income of the region has been declined from 1999 to 2006 (-5.7%).

Per capita income of the region remains at the same level of the nation, but is lower than that of California by 6 percent. The relative income level of the region to the nation has declined from 1.27 in 1959 to 0.98 in 1999. Over the last three decades, the SCAG region's per capita income ranking dropped from the 4th highest in 1969 to 7th in 1989, and 16th in 1999. The SCAG region continued to rank last in terms of per capita income among the 17 largest metropolitan regions in the nation in 2005.

Median household income increased by 22 percent from 1999 to 2006. However, this increase was only about 80 percent required to keep up with inflation. Thus, real median household income was down by 4%. In 2006, median household income of the region was 15 percent above the national average, but was lower than that of California by 1.5 percent. The relative income level of the region to the nation has remained 9 percent to 23 percent above the national average for the periods of 1969, 1979, 1989, and 1999.

Average income statistics, however, mask how much poverty is present in the region. In 2006 nearly 14 percent of the region's residents lived in poverty compared to around 13 percent for California and the nation as a whole. Around 18 percent of Imperial County residents live in poverty, followed by Los Angeles County at 15 percent. The poverty rates of Ventura, Orange, and Riverside County residents are lower than that of California or the nation.

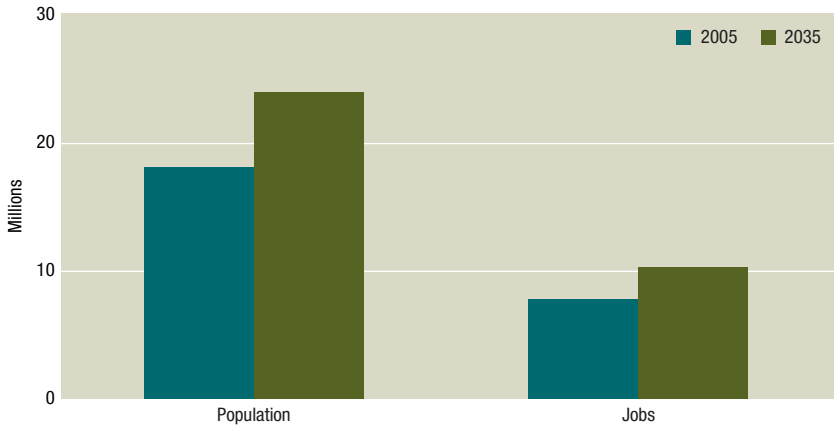
Partly because of the higher than national average poverty levels and partly because of the high cost of home ownership in California, the region lags the nation in homeownership rates. During the last decade, median home values in California and the most populous areas of the region have risen due to construction activity lagging population growth, low inventory and historically low interest rates. Median home values in California has reached the $462,000 mark, which is more than double the national median. In 2006, 56.5 percent of regional residents owned their own home compared to 67.3 percent for the nation as a whole.

PATTERNS OF FUTURE GROWTH

A baseline growth forecast is a snapshot of the most likely population and employment level in the future. It is a technical growth forecast without regional policy input, and reflects historical trends, based on reasonable key technical assumptions, and existing and newly approved local or regional projects. Specifically, the baseline growth forecast is a result of updating the 2004 RTP no-project growth forecasts with current demographic and economic trends, the latest land use changes, newly approved regionally significant projects, general plan or specific plan update, and/or zoning revisions.

According to the baseline growth forecast summarized in Figure 6, the region will add 5.9 million people to reach 24 million people by 2035. Supporting this population in 2035 will be a total of 10.3 million jobs in 2035 with 2.5 million new jobs. This level of population and job growth is expected to yield 2 million additional households in the region at an average of three persons per household. The substantial amount of projected growth will pose serious transportation and air quality challenges for the region.

FIGURE 6 POPULATION AND EMPLOYMENT, 2005 AND 2035



Source: CA Department of Finance, CA Employment Development Department, SCAG Employment Estimates, SCAG Baseline Growth Forecast

Where will all these people come from? Approximately 85 percent of the region's population growth in the future is due to natural increase. The region is expected to experience a net loss in domestic migration, but this will be more than offset by international immigration. As the region grows, the average person will be older, and Hispanics will become the majority ethnic group.

TABLE 3 SOCIO-ECONOMIC INDICATORS, 2005 AND 2035

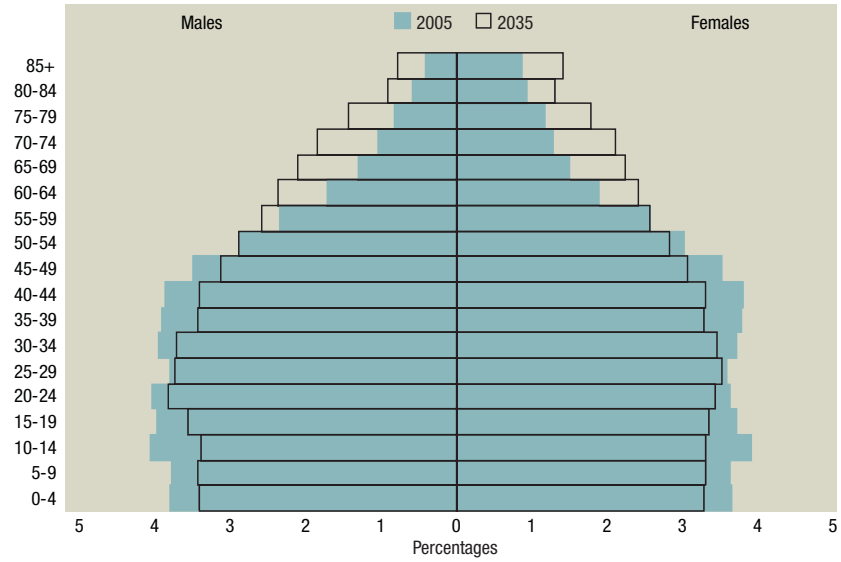
	2005**	2035	Change	% Change
Total population ('000), % Change (2005-2035)	18,147	24,056	5,909	33%
Persons under 16 years old (%)	24.4	21.4	-2.9	
Persons 16-64 years old (%)	65.7	62.7	-3.0	
Persons 65 years old and over (%)	9.9	15.9	6.0	
Median age	32.9	35.9	3.1	
Total dependency ratio*	52.1	59.5	7.4	
Child dependency ratio	37.1	34.2	-2.9	
Old-age dependency ratio	15.1	25.3	10.3	
Births per 1,000 population	15.9	14.4	-1.4	
Total fertility rate (per woman)	2.05	2.02	-0.03	
Deaths per 1,000 population	6.3	6.9	0.7	
Natural increase (%) (2000-2005, 2005-2035)	55.0	84.0		
Net migration (%) (2000-2005, 2005-2035)	45.0	16.0		
Non-Hispanic White persons (%)	36.0	21.9	-14.1	
Non-Hispanic Black persons (%)	7.1	5.8	-1.2	
Non-Hispanic Asian & Other persons (%)	13.8	17.0	3.3	
Hispanic persons (%)	43.1	55.2	12.0	
Households ('000), % Change (2005-2035)	5,687	7,710	2,023	36%
Total population per household (PPH)	3.19	3.12	-0.07	
Householders 65 years old and over (%)	17.3	26.5	9.2	
Total employment ('000), % Change (2005-2035)	7,771	10,287	2,516	32%
Agriculture & Mining (%)	1.0	0.8	-0.2	
Manufacturing (%)	10.7	7.7	-3.0	
Service (%)	88.3	91.5	3.2	

Note: * a measure showing the number of dependents (aged 0-15 & over 65) to working age population (aged 16-64). Dependents per 100 working age population. ** model estimate

Source: SCAG Baseline Growth Forecast

The population in the region will become older because of aging "baby boomers.", born between 1946 and 1964. The median age will rise from 32.9 years in 2005 to 35.9 in 2035. The population aged 65 and older will grow four-and-a-half times faster than the working age population (16-64 years old) between 2005 and 2035. As a result, workers in the region would support a larger share of older "baby boomer" population in 2035.

FIGURE 7 POPULATION AGE PYRAMID, 2005 AND 2035



Source: SCAG Baseline Growth Forecast

Due to the retirement of "baby boomers," the region may experience severe shortages of skilled labor. The aging baby boomers may postpone the retirement or the female labor force may increase the labor force participation. If domestic migration does not make up the shortage of skilled labor, then more foreign immigration will be needed. The skills of the new labor force, particularly recent immigrants, will probably not match the requirements of the skilled jobs. This could depress the overall income level of the workers and households. Long-term strategies to achieve growth and equitable distribution of income should be considered, including appropriate and enhanced educational opportunities and a phased retirement system.

Shifting demographic patterns will also influence travel behavior. The elderly people travel less than the younger population and the elderly workers tend to work at home. If necessary, they commute to work for a shorter distance. Recent immigrants tend to use transit much more than other population groups. Urban density levels may also increase since foreign-born residents urbanize less land. Many SCAG region foreign-born, Hispanic, and Asian residents have modest incomes, larger household sizes, and tend to double up in existing urban areas, thereby increasing population density. The socioeconomic characteristics and lifestyle choices associated with immigration are consistent with a more compact urban form.

The overall number of persons per household will be smaller in the region in 2035 as the downward pressures are exerted by aging "baby boomers" and lower birth rates, while there are upward pressures from increasing Hispanic populations with relatively large households (especially recent immigrants). The number of persons per household may increase in some built-out areas over the projection horizon due to the limited availability of developable land. The racial and ethnic composition of households will reflect the population diversity and create demand for a wider variety of housing types than are most prevalent today. Specifically, there will be more need for close-in and infill housing, condominiums and multi-family housing.

Jobs will be created across all employment sectors, except the manufacturing sector. The largest gains will be in service sector jobs as the shift in the region from manufacturing jobs to service sector jobs continues. Between 2005 and 2035, service sector jobs will lead in total growth and comprise the largest share of total jobs. The makeup of service sector jobs will also change, with different employment opportunities. Three top leading sectors include 1) education and health services, 2) professional and business services, and 3) construction. These fast growing sectors are supported by the continued growth of population and demographic changes (e.g., aging of baby boomers). With continued globalization, the share of the manufacturing sector will continue

to decline its share from 11 percent in 2005 to 8 percent in 2035. The manufacturing sector still remains important and there are growth opportunities in the high tech manufacturing sector. The decline of the manufacturing sector might result in the lower income level of workers and households. The policy strategies might focus on creating more high-wage and salary service sectors, which include 1) information, 2) public administration, 3) financial activities, 4) wholesale trade, and 5) transportation and warehousing, and utilities. The logistics sector, comprising of wholesale trade, transportation, and warehousing, might become more important in the region's economic growth as the region's foreign trade activities continue to grow. The significant growth of the construction sector might influence the future traffic congestion in the region. The workers in the construction sector tend to commute to work for the longer distance, but they use carpooling much more than other workers.

TABLE 4 EMPLOYMENT BY SECTOR, 2005 AND 2035

Sectors (NAICS)	2005		2035		Change		
	Number	%	Number	%	Number	% Change	Change in %
Agriculture & Mining	78,000	1%	86,000	1%	8,000	10%	0%
Construction	465,000	6%	687,000	7%	222,000	48%	1%
Manufacturing	835,000	11%	792,000	8%	(43,000)	-5%	-3%
Wholesale Trade	386,000	5%	458,000	4%	72,000	19%	-1%
Retail Trade	841,000	11%	1,122,000	11%	281,000	33%	0%
Transportation and Warehousing, and Utility	349,000	4%	418,000	4%	69,000	20%	0%
Information	278,000	4%	362,000	4%	84,000	30%	0%
Financial Activities	504,000	6%	601,000	6%	97,000	19%	-1%
Professional and Business Services	1,197,000	15%	1,770,000	17%	573,000	48%	2%
Education and Health Services	1,546,000	20%	2,299,000	22%	753,000	49%	2%
Leisure and Hospitality	746,000	10%	1,027,000	10%	281,000	38%	0%
Other Services	313,000	4%	366,000	4%	53,000	17%	0%
Public Administration	234,000	3%	301,000	3%	67,000	29%	0%
Total	7,771,000	100%	10,287,000	100%	2,516,000	32%	0%

Source: SCAG Baseline Growth Forecast

The overall economic well-being of residents in the region improves during the planning period. The median household income of the region is expected to increase by one-half percent per year from $46,000 (in 1999 dollars) in 2005 to $53,000 (in 1999 dollars) in 2035. The higher income households with more than $100,000 (in 1999 dollars) increase two or three times faster than low and middle income households. The projected income level and distribution affects auto ownership, trip generation, and mode choice. For example,

the higher household income implies more cars available for travel, more trip generation, and more driving than transit use.

Table 5 summarizes the baseline growth forecast versus the policy growth forecast by county in terms of 2035 population, households, and employment. Although the baseline growth forecast extrapolates the historical growth trends, the policy growth forecast calls for an advisory redistribution of growth at the county, subregion, city, and traffic analysis zone (TAZ) levels. The implementation of the policy growth forecast would be voluntary and it complements the baseline growth forecast.

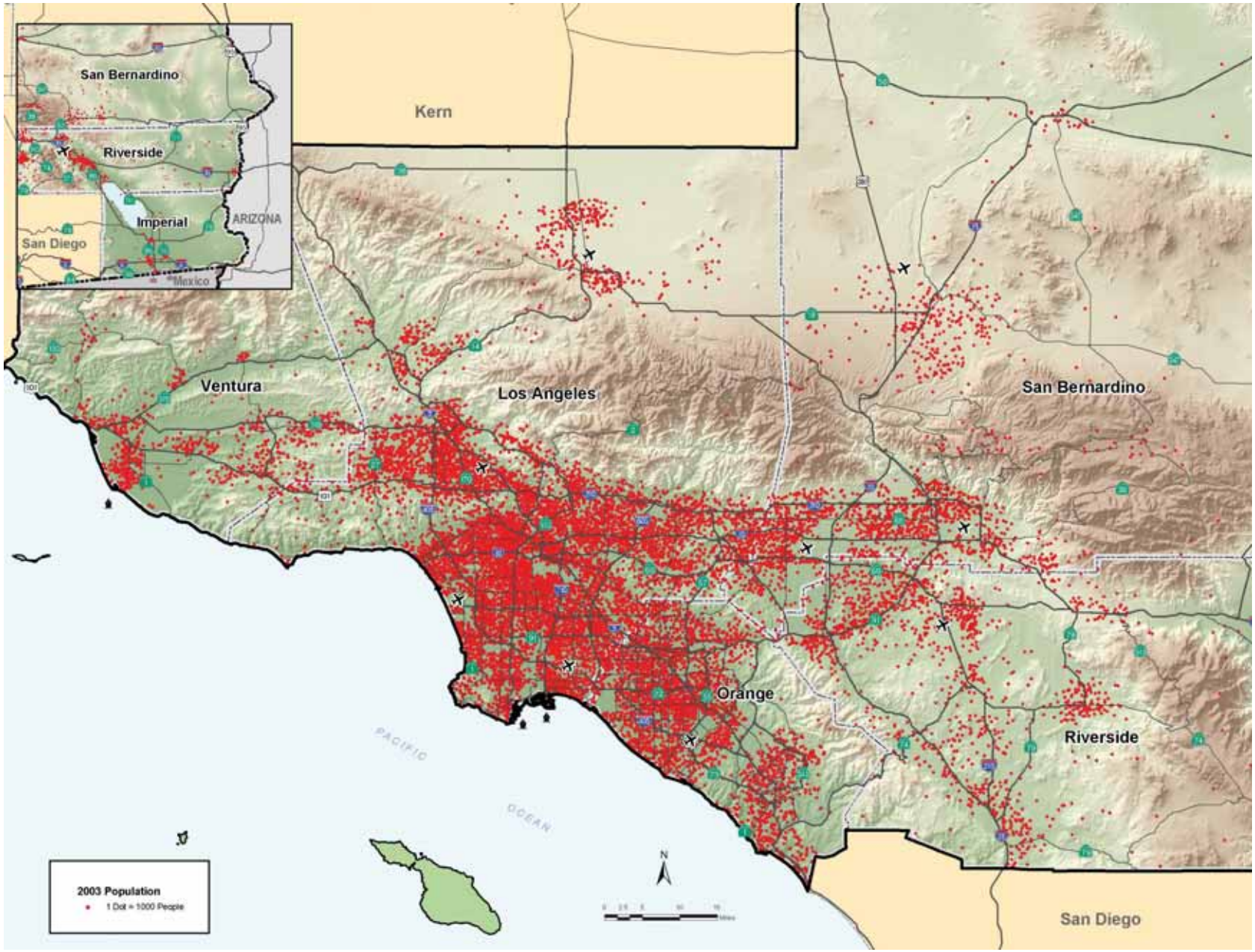
TABLE 5 2035 POPULATION, HOUSEHOLDS, AND EMPLOYMENT (IN THOUSANDS)

County	Baseline Forecast			Policy Forecast		
	Population	Households	Employment	Population	Households	Employment
Imperial	320	103	133	314	101	132
Los Angeles	12,338	4,003	5,041	12,588	4,087	5,091
Orange	3,654	1,118	1,982	3,699	1,134	1,991
Riverside	3,597	1,183	1,414	3,472	1,142	1,387
San Bernardino	3,134	973	1,255	2,957	914	1,220
Ventura	1,014	330	463	1,025	334	466
SCAG Region	24,056	7,710	10,287	24,056	7,710	10,287

Source: SCAG Baseline and Policy Growth Forecast

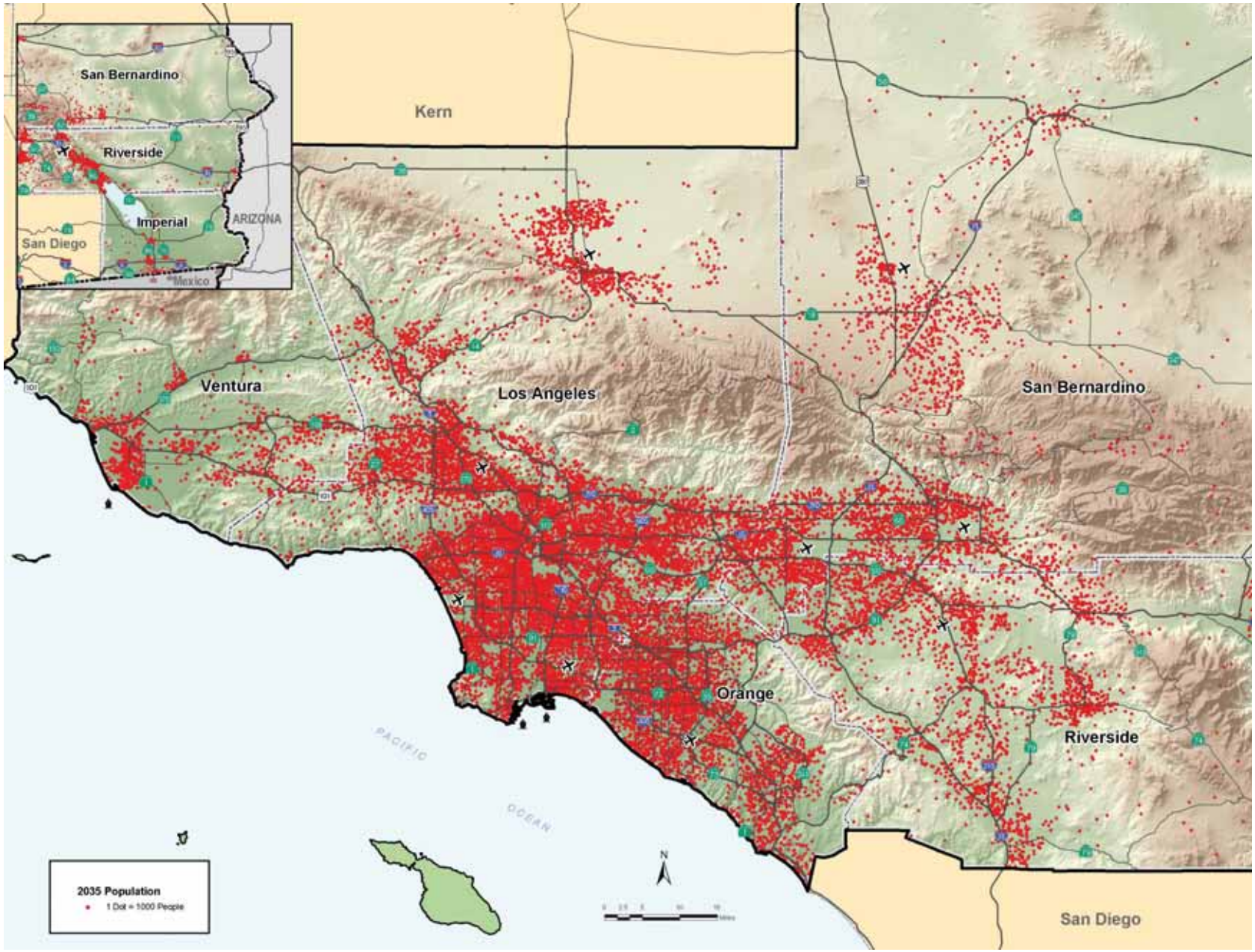
Where do we live and work now, and where will we live and work in the future? The regional baseline forecast is distributed to counties, subregions, and smaller geographies through an interactive collaborative process in which cities, subregions, regional agencies, experts, and stakeholders participated. Input from local jurisdictions plays an important role in determining the baseline growth distribution within their boundaries. Exhibit 1 shows where we live in 2003 and Exhibit 2 shows where we are forecast to live in 2035. Exhibit 3 shows the difference between the two time periods. In terms of where we work, Exhibit 4 shows 2003 employment clusters, while Exhibit 5 shows anticipated 2035 employment clusters. As with population, Exhibit 6 shows the differences. The baseline forecast supports the current urban sprawl from Los Angeles and Orange Counties to Riverside and San Bernardino Counties. It would yield a growth scenario very similar to the status quo, taking a somewhat "business as usual" approach that is not steered by regional policies. Thus, for example, fast-growing suburban cities would likely continue to grow primarily through auto-oriented single family housing with commercial activities focused toward the highway system. The baseline growth distributions would result in severe traffic congestion and vehicle emission. The baseline land use could be tempered, and in some cases bolstered, by policies and programs designed to improve future travel patterns and vehicle emissions.

EXHIBIT 1 2003 POPULATION



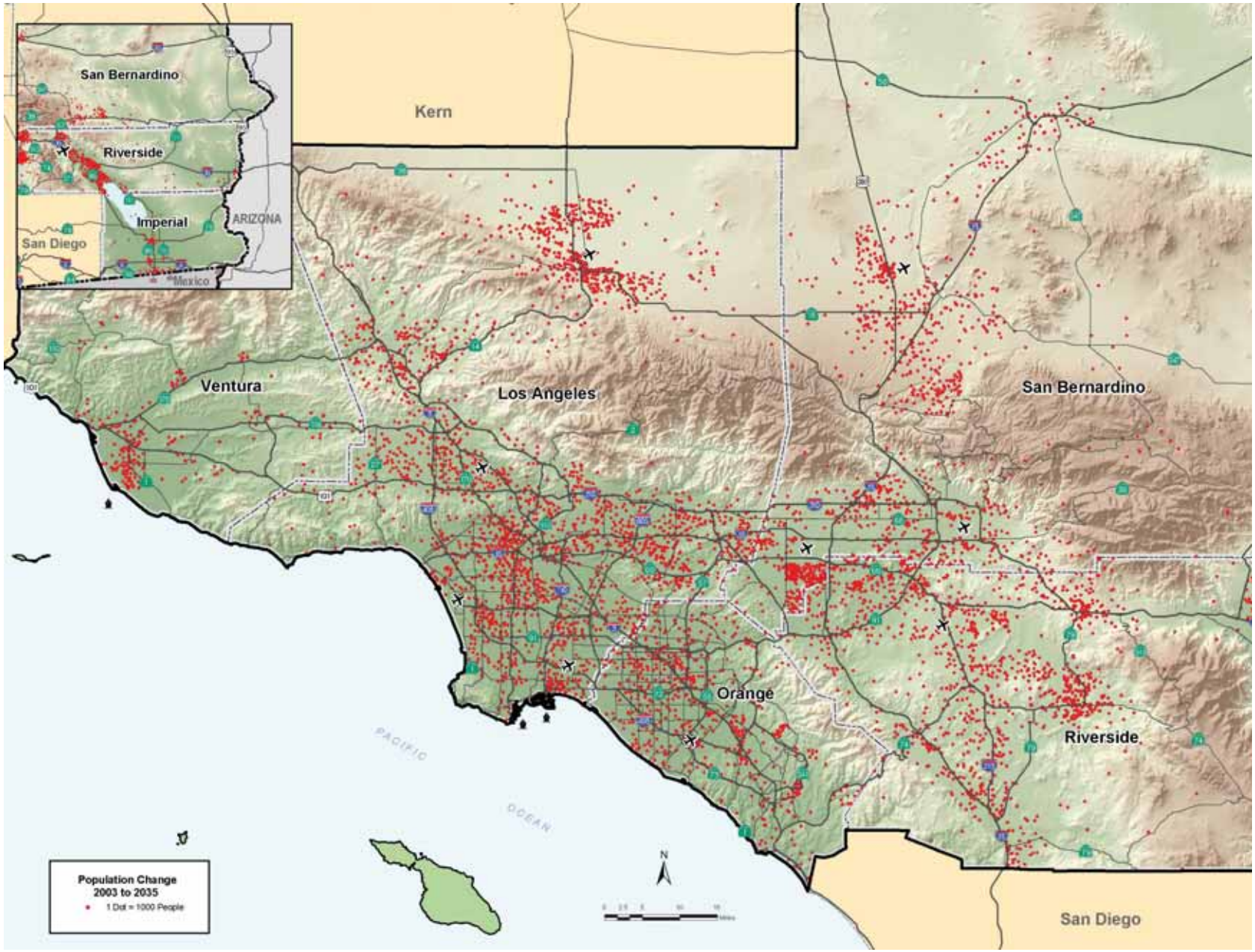
Source: Southern California Association of Governments, ESRI StreetMap USA, Teleatlas

EXHIBIT 2 2035 POPULATION



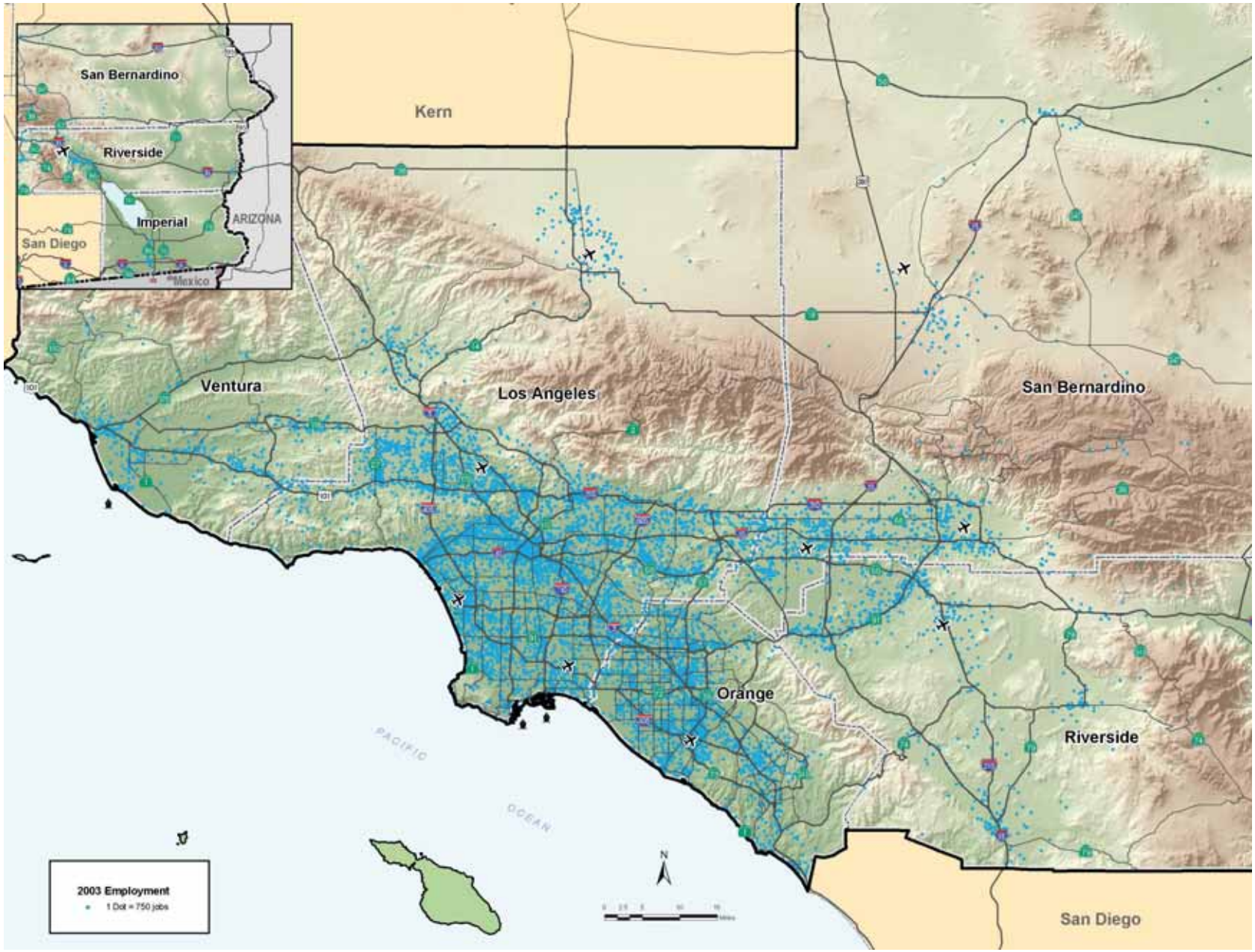
Source: Southern California Association of Governments, ESRI StreetMap USA, Teleatlas

EXHIBIT 3 2003 POPULATION INCREASE 2003-2035



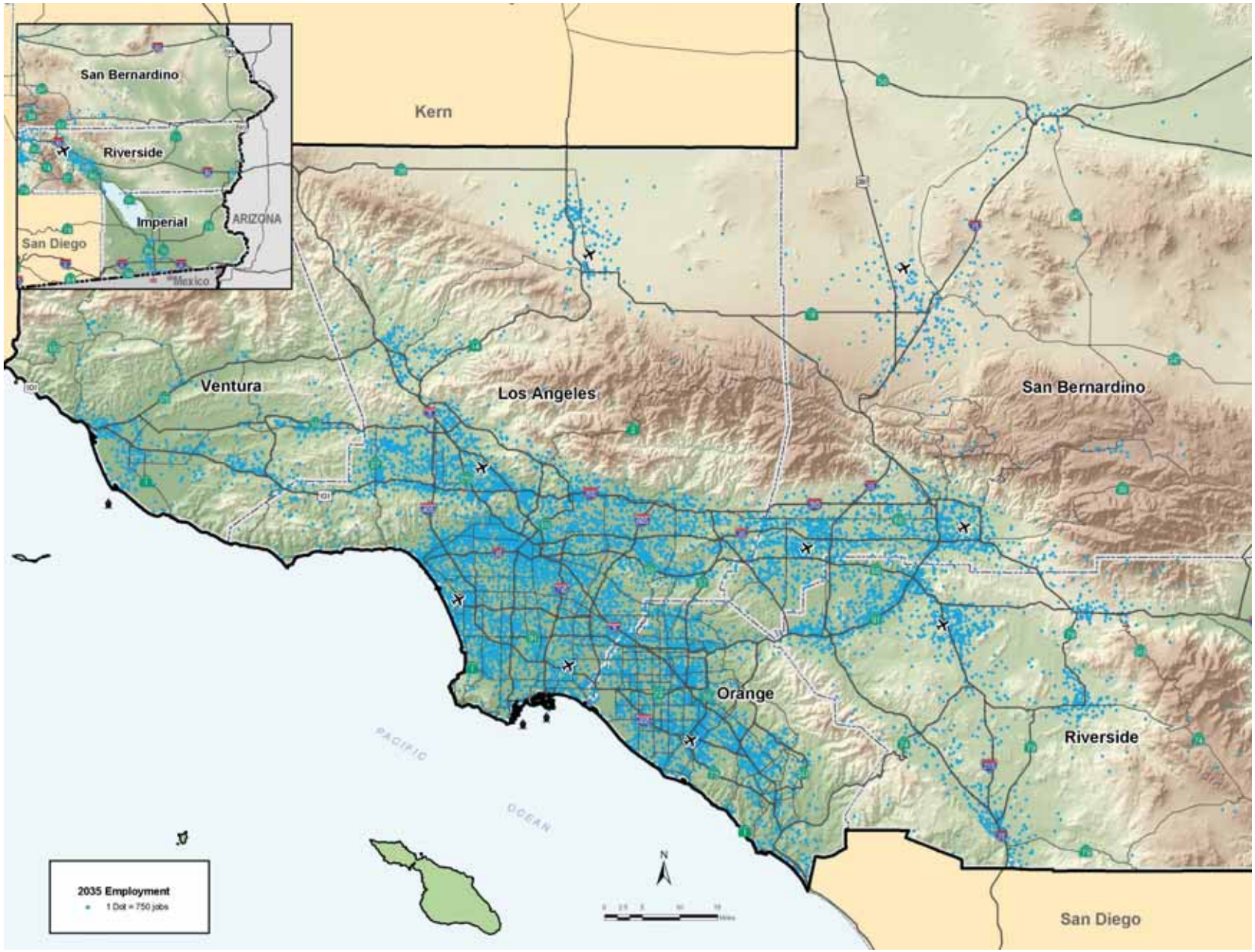
Source: Southern California Association of Governments, ESRI StreetMap USA, Teleatlas

EXHIBIT 4 2003 EMPLOYMENT



Source: Southern California Association of Governments, ESRI StreetMap USA, Teleatlas

EXHIBIT 5 2035 EMPLOYMENT



Source: Southern California Association of Governments, ESRI StreetMap USA, Teleatlas

EXHIBIT 6 EMPLOYMENT INCREASE 2003-2035

Source: Southern California Association of Governments, ESRI StreetMap USA, Teleatlas

BUILDING THE 2008 RTP GROWTH FORECAST

Prior to formulating the 2008 Plan Alternative and assessing its transportation benefits, the appropriate land use assumptions were established. This began with population and economic forecasts through SCAG's Integrated Growth Forecasting process, which laid the foundation for the land use assumptions that were then developed in collaboration with local governments. In order to yield transportation model performance that legitimately accounts for the resulting air quality benefits, the assumptions must be: 1) reasonable and realistic; 2) based on the best and most up-to-date information; and 3) must be consistent with planned transportation infrastructure. Outlined in this section are the numerous actions taken by SCAG to develop land use assumptions that meet these requirements.

INTEGRATED GROWTH FORECAST

In February 2005, SCAG's Community, Economic and Human Development Committee (CEHD) approved and directed staff to proceed with the 2008 RTP Growth Forecast Update Process, now known as the 2008 "Integrated Growth Forecasting" process. The resulting Integrated Growth Forecast established the population, employment, households and housing units forecasted in the region for use in both the RTP and the state-mandated Regional Housing Needs Assessment completed in July 2007. SCAG's Plans & Programs Technical Advisory Committee also assisted in the process by providing technical input. Policy Committees of the Regional Council were periodically informed of progress and provided additional direction to the process.

The Integrated Growth Forecast sets the optimal stage for a future regional growth scenario as it ties housing to transportation planning, considering both needs simultaneously in communities throughout the region. This approach ensures that the resulting assumptions are consistent with planned transportation infrastructure. Based on a combination of recent and past trends, reasonable key technical assumptions, and existing and new local or regional policy options, the Integrated Growth Forecast provides the basis for developing the land use assumptions at the regional and small area levels which build the Plan Alternative.

DEVELOPMENT OF THE INTEGRATED GROWTH FORECAST

Development of the Integrated Growth Forecast involved several steps. The first entailed an analysis of recent regional growth trends and the collection of significant local plan updates. A variety of large area estimates and projections were collected from the federal and state governments. The sources included information from the following agencies:

- U.S. Department of Commerce, Census Bureau and Bureau of Economic Analysis,
- U.S. Department of Labor, Bureau of Labor Statistics,
- U.S. Internal Revenue Service (IRS),
- U.S. Citizenship and Immigration Services,
- U.S. Department of Health and Human Services,
- California Department of Finance (DOF),
- California Employment Development Department,
- Information received through the Intergovernmental Review process, and
- Small area estimates and projections were also available from aerial land use data, data from ES202, CTPP, general plan, parcel level data from tax assessor's office, building permits from Construction Industry Research Board and demolition data from the DOF.

Next was the review and update of the 2004 regional growth forecast methodology and key assumptions used as part of SCAG's 2004 Regional Transportation Plan. The widely used methodology included the cohort-component and shift-share methods. The key technical assumptions included updates regarding the fertility rate, mortality rate, net immigration, domestic in-migration,

domestic out-migration, labor force participation rates, double jobbing rates, unemployment rates, and headship rates.

A review and update of existing regional growth policies and strategies was conducted, including Compass Blueprint strategies, economic growth initiatives, Goods Movement strategies, and others. Relevant analyses included general plan capacity analyses, demonstration projects, regional growth principles, polling and focus groups, and public workshops.

The next step was to develop and evaluate the draft regional Integrated Growth Forecast scenarios with small area distributions. Regional growth forecast scenarios were developed and allocated into the smaller geographic levels using public workshops. The small area distributions of the regional growth were evaluated using transportation and emission modeling results and environmental impact review.

Last was the selection and adoption of a preferred regional growth forecast, followed by the development of a regional growth scenario with selected small area distributions using transportation and environmental performance measures.

An organized forecasting decision making process is required to develop a consensus regional growth forecast in an efficient, open, and fair manner. A variety of groups or input involved in the forecasting process include panel of experts, subregional/local review, stakeholders/data users, public outreach, technical committee, policy committee, and the Regional Council. Steps included:

1. Survey of local jurisdictions regarding recent changes in general plan and developments that could affect the long-term growth patters envisioned in the 2004 RTP/Growth Vision policy forecast.
2. Provision to Transportation Modelers of the extended Year 2000 socioeconomic data set for new model development and calibration.
3. Collaboration with subregions/local jurisdictions, review and revision of the 2003 base year small area distribution of employment, population, and household, and completion/delivery of the 2003 extended socioeconomic data set to Modeling Division.
4. Request and receipt of input from subregions regarding their perspectives of future growth in population, employment and household.
5. Review and presentation of recent trends in population, employment and household growth and completion of preliminary 2008 RTP no-project growth forecasts at regional, county, subregion levels.

During 2006, with additional assistance from the 2007 integrated growth forecasting consultant teams, the following major milestones were accomplished for the 2008 Integrated Growth Forecasting process:

- January 2006: Convened the Panel of Experts to review and comment on 2008 RTP growth forecast at regional/county/subregion level.
- February 2006: Counties/subregions and local jurisdictions were invited to present their perspectives on growth and any pertinent growth issues to SCAG staff and the Panel of Experts.
- March – August 2006: Presented the updated 2008 RTP growth forecasts at region and county levels to the Plans & Programs Technical Advisory Committees and Panel of Experts.
- September 14, 2006: CEHD approved and directed staff to proceed with the disaggregation of the draft 2008 integrated regional/county forecasts into smaller geographic levels and scheduling of subregion/local jurisdiction workshops and inputs process.
- October – January 2007: Completed 15 subregional workshops, including interactive exercise of 2035 growth scenarios, and RHNA exercise 2005-2014.
- AB 2158 factors form filled out.
  - Formal and informal comments received
  - Follow-up meetings with local subregions/jurisdictions.

INTEGRATED GROWTH FORECAST METHODOLOGY – REGIONAL/ COUNTY LEVEL

POPULATION FORECASTS

Two factors account for population growth: natural increase (which is the balance between births and deaths) and net migration (which is the balance between the number of people coming and leaving the region).

Net migration is differentiated between domestic migrants (people moving in and out of the region to other parts of the nation, immigrants (legal and undocumented) moving to the region from other countries.

FIGURE 8

SCAG projects regional population using the cohort-component model. The model computes the population at a future point in time by adding to the existing population the number of group quartered population, births and persons moving into the region during a projection period, and by subtracting the number of deaths and the number of persons moving out of the area. This process is formalized in the demographic balancing equation.

The fertility, mortality and migration rates are projected in five year intervals for eighteen age groups, for four mutually exclusive ethnic groups: Non-Hispanic White, Non-Hispanic Black, Non-Hispanic Asian and Hispanic. The birth rates are also projected by population classes: residents (and domestic migrants) and international migrants.

SCAG links population dynamics to economic trends, and is based on the assumption that patterns of migration into and out of the region are influenced by the availability of jobs. The future labor force supply is computed from the population projection model by multiplying civilian resident population by projected labor force participation rates. This labor force supply is compared to the labor force demand based on the number of jobs projected by the shift/share economic model.

The labor force demand is derived using a two step process. The first step is to convert jobs into workers using the double job rate, which is measured by the proportion of workers holding two jobs or more to total workers. The second step is to convert workers into labor force demand using the ideal unemployment rate. If any imbalance occurs between labor force demand and labor force supply, it is corrected by adjusting the migration assumptions of the demographic projection model. Adjustment of migration assumptions is followed by total population changes.

The county forecasts are developed by analyzing the difference between the sum of initial county forecasts and the regional independent projections. If results are significantly divergent, input data at the county level is adjusted to bring the sum of counties projection and the regional independent projections more closely in line. Complete agreement between two projections is not mandatory. After analysis, the sum of counties constitutes the regional forecasts.

EMPLOYMENT FORECASTS

Employment forecasts utilize a top-down procedure starting with a U.S. forecast, followed by California, and finally the SCAG region and counties. The regional employment forecasts will interact with the regional population forecasts.

The first step is to project the U.S. labor force based on projections of total population and labor force participation rates. Total jobs are projected from total labor force, unemployment rate, and the ratio of total jobs to employed residents. Total jobs are then projected to a one-digit industry code based on historical trends of the one-digit shares of U.S. total jobs.

The second step is to forecast California total jobs for each forecast year based on U.S. total jobs and the job share of California to U.S. for each forecast year.

California total jobs are then projected to the one-digit industry code based on historical trends in the one-digit shares of California total jobs.

The third step is to forecast regional total jobs for each forecast year based on California total jobs and the job share of the SCAG region to California for each forecast year. Total jobs are then projected to a one-digit industry code based on historical trends in the one-digit share of SCAG regional total jobs.

The fourth step is to forecast county total jobs for each forecast year based on regional total jobs and the job share of each county to the SCAG region for each forecast year. Total jobs are then projected to a one-digit industry code based on historical trends in the one-digit share of county total jobs. The preliminary are adjusted by future aging patterns and related labor force patterns of each county.

HOUSEHOLD FORECASTS

A household includes all the persons who occupy a housing unit as their usual place of residence. By definition, the count of households or householders is the same as the count of occupied housing units for 100-percent tabulations.

SCAG projects regional households by using headship rate method. The projected households at a future point in time are computed by multiplying the projected resident population by projected headship rates. The headship rates are projected by age, sex, and race/ethnicity.

Headship rate is the proportion of a population cohort that forms the household. It is specified by age and ethnicity. Headship rate is projected in five year intervals for seven age groups (for instance, 15-24, 25-34, 35-44, 45-54, 55-64, 65-74, 75+), for four mutually exclusive ethnic groups.

HOUSING UNIT FORECASTS

A housing unit is a house, an apartment, a mobile home or trailer, a group of rooms or a single room occupied as separate living quarters or, if vacant, intended for occupancy as separate living quarters. Separate living quarters are those in which the occupants live and eat separately from any other persons in the building and which have direct access from outside the building or through a common hall. Both occupied and vacant housing units are included in the housing unit inventory.

A housing unit is vacant if no one is living in it at the time of enumeration, unless its occupants are only temporarily absent. Units temporarily occupied at the time of enumeration entirely by persons who have a usual residence elsewhere are also classified as vacant. Vacant units include vacant units for: sale only; rent only; seasonal, recreational, or occasional use; migrant workers; rented or sold, not occupied; other.

SCAG projects regional housing units by using "total vacancy rate method." The projected housing units at a future point in time are computed by dividing the projected households by occupancy rates (e.g.,1- total vacancy rates). Total vacancy rate is calculated by dividing the number of total vacant units by the number of total housing units.

INTEGRATED GROWTH FORECAST METHODOLOGY – CITY LEVEL

The overall framework for the city level demographic forecasts is provided by the household (occupied housing units) method. This approach is widely accepted and applied in forecasting socioeconomic growth for smaller geographic areas. The household method consists of the following three major projection components: housing units, households (occupied housing units) and population.

POPULATION FORECASTS

City population is projected as the group quarters population plus the product of households and average persons per household (PPH). The average number of persons per household is projected using the historical trend and the updated county PPH. Group quarters population is projected using its ratio to

total population from the 2000 Census, which is assumed to remain constant during the projection horizon.

EMPLOYMENT FORECASTS

The distribution of county jobs to city applies a "constant-share" approach to calculate city employment. Based on constant-share approach, city job growth is a function of city share to county jobs for each sector and future county job growth. If a city in Los Angeles County is specialized in a specific industry (e.g., manufacturing), its future job growth will be affected by future reduction of manufacturing jobs of Los Angeles County. The constant-share approach provides a reasonable job estimates for the future, which form a reasonable basis for future subregional input process.

HOUSEHOLD FORECASTS

The draft city household forecasts reflect long term growth patterns incorporated in the 2004 RTP forecasts, recent trends, and updated county household forecasts.

- Each local jurisdiction's household growth was first projected by using the "Constrained Exponential Growth Equations" with their respective long term historical trend data between 1980 and 2000.
- "Constrained" in the above methodology is to ensure that all local jurisdictions add up to county total.
- Provide the projected household growth to all local jurisdictions for comments and inputs and make adjustments accordingly.
- Adjust forecasting errors—actual 2005 vs. forecasted 2005—and apply to 2035.
- Control to revised county forecasts from the 2007 Integrated Growth Forecasts.

The household forecast for all local jurisdictions and unincorporated areas are attached for subregion/local jurisdiction workshops. The household growth between 2005 and 2014 forecasted for each local jurisdiction, plus replacement and vacancy adjustment is the starting allocation for the RHNA construction need.

HOUSING UNIT FORECASTS

The projected housing units are computed by using the projected households and total vacancy rate. The city level total vacancy rate is based on the 2000 Census, and it is assumed to remain constant during the projection horizon.

INTEGRATED GROWTH FORECAST METHODOLOGY – SMALL AREA

The small area baseline socioeconomic projection refers to the most likely growth distribution of population, household, and employment at small geographical area levels without any explicit regional policies. The base year is 2003 and the projection horizon is 2005-2035 in five year increments. The small area geographies include SCAG's Traffic Analysis Zones (TAZ) and US Census Tracts (CT). Because of its technical/trend nature, the small area baseline projection is primarily based on the small area local input projection from local jurisdictions through SCAG's extensive local review and input process. The small area baseline projection captures demographic trends, existing land uses, and general plan land use policies and is controlled to city, county and regional baseline projections. Different methodologies have been applied to project total population, household, and employment in the target year (2035) and in the intermediate years (2005-2030 in five year increments).

2035 SMALL AREA PROJECTION

Over the past several years, SCAG embarked on a very extensive growth forecasting outreach process soliciting local review/input on small area distribution of projected future growth. The small area level input submitted by local

jurisdictions varies substantially from jurisdiction to jurisdiction. For those local jurisdictions that have provided complete small area level input, their 2035 small area population, household, and employment projections form the 2035 small area baseline projection for these jurisdictions.

For all the other jurisdictions that did not provide complete small area level input, the 2035 small area baseline projection is developed by integrating the small area local input with the 2008 RTP small area trend projection. The 2008 RTP small area trend projection represents an update to the 2004 RTP small area trend projection. As a result, the fundamental methodology remains the same.

HOUSEHOLD PROJECTION

The first step is to project target year single households (SDOs). This is done by comparing small area 1990 to 2000 growth in SDOs with their cities' growth in SDOs for the same period. SCAG applies that same relationship to the cities' base year to target growth to infer each small area share of that growth. This target year small area projection is than averaged with SCAG's previous RTP projection for the same small area to get a final projection. These projections are adjusted to make sure they are consistent with the city's forecast.

The next step is to project target year total households by first estimating each small area's percentage of single households. This is done by using the base year small area's single percentage compared to the city's. This relationship is then applied to the city's target year single percentage to get the small area's target year percentage. Once the small area's total target year single households and single percentage have been projected, SCAG calculates the total household projection by dividing the single projection by the single percentage.

The third step is to incorporate regionally significant Inter-Governmental Review (IGR) projects. Specifically, for small areas where an IGR project is located, a minimum household projection is set for each small area based on the number of housing development that will occur in that small area.

The final step is to normalize the small area household projection to meet the city, county, and regional level household projections.

POPULATION PROJECTION

Similar to the household projection method, the first step is to project target year residential population based on projected small area household size and the projected target year small area household. SCAG calculates the target year household size by applying the base year ratio of small area to city household size to the city's target year household size.

The second step is to project target year group quarter populations (GQP). SCAG makes the following assumptions about group quartered population projections: no changes in military bases (closings or new construction), no new prisons, jails, or mental hospitals will be built, and, no new major universities or colleges (except Calif. State U., Channel Islands). The target year group quartered population is calculated by applying the small area's base year share of the city's GQP to the city's target year projection. The target year small area total population is simply the sum of the residential population and the GQP.

The third step is to incorporate regionally significant Inter-Governmental Review (IGR) projects. Specifically, for small areas where an IGR project is located, a minimum population projection is set for each small area based on the number of projected households that will reside in that small area due to the project.

The final step is to normalize the small area population projection to meet the city, county and regional level population projections.

EMPLOYMENT PROJECTION

Again, similar to the household projection method, the first step is to project target year service employment. SCAG uses a mix of the base year and the

previous RTP's target year small area's share of the city's service employment. This share is applied to the city's target year projection of service jobs.

The next step is to project the percent of service employment to total employment applying the same method as was done for percentage of single households. Given these two projections, total employment can be calculated by dividing the service employment by the percent of service employment.

The third step is to incorporate regionally significant Inter-Governmental Review (IGR) projects. Specifically, for small areas where an IGR project is located, a minimum employment projection is set for each small area based on the number of forecasted jobs that will be created by the development project.

The final step is to normalize the small area employment projection to meet the city, county and regional level employment projections.

2005-2030 Small Area Projection

It is assumed that the small area growth pattern in all intermediate years as compared to the 2003-2035 small area growth will follow the city growth pattern. For example, if a city reaches twenty percent of its 2003 to 2035 growth by 2010, all the small areas within the city will also reach the same twenty percentage of their corresponding small area 2003 to 2035 growth by 2010. Based on the assumption, an interpolation method, the city-growth-share method, has been applied to forecast 2005-2030 household, population, and employment in five year increments.

The city-growth-share method ensures consistent trends at small area levels between intermediate years and 2003-2035. The method also guarantees that all the intermediate year projections meet their respective city, county, and regional controls.

Local Survey

SCAG relies on local jurisdictions to update socioeconomic estimates and forecast at the small area level. The updated zoning and general plan of each jurisdiction play a key role in adjusting the current small area growth forecast. In April 2005, SCAG sent out a letter requesting assistance from local jurisdictions to get updated land use and development information for developing the 2008 RTP integrated growth forecast. SCAG made adjustments to the existing small area estimates and forecast, as the updated information was submitted by local jurisdictions. The updated information includes land use change, approval of regionally significant development projects unknown in 2002, update of general plans or specific plans since 2002, change of zoning standards, or revision of build-out capacities.

Expert Review

The 2007 RTP Integrated Growth Forecast process is driven by a principle of collaboration between SCAG, subregions, local jurisdictions, county transportation commissions, and other major stakeholders throughout the region. The Plans & Programs Technical Advisory Committee (P&P TAC) assists in the process by providing technical input; Policy Committees of the Regional Council are periodically informed of progress and provide direction to the program through the actions they take.

An organized forecasting decision making process is required to develop a consensus regional growth forecast in an efficient, fair, and open manner. Those involved in the forecasting process to build consensus include: a panel of forecasting experts, subregions, local workshops, stakeholders, data users and researchers, technical committees, policy committees, and the Regional Council.

In May 2006, a Panel of Experts reviewed SCAG's 2007 Integrated Growth Forecast methodology, procedure, and results. The panel concluded and suggested that:

- Policy components are needed, even in the case of the Baseline forecast. The baseline numbers cannot stand alone; the region must concentrate on how policy supports and affects future forecasts. These policies must be explicit and easily identifiable.

- The regional employment forecast may be conservative, especially if the region could adopt effective policies that boost economic growth. Panel members sought a better understanding of the types of jobs associated with the employment forecast for the SCAG region.
- Housing and jobs are inextricably linked. The region, or subregions, will not achieve the robust job growth without housing production to match. Jobs will relocate to areas with housing either within the region or to other regions.
- The demographics, from the success of 2nd and 3rd generation immigrants and the associated positive changes in their socioeconomic status could have large impacts on household formation and housing demand.
- In the first half of 2007, the Panel of Experts met twice to further discuss and provide input on:
  - The policy implications of technical forecasts, structure change of the economy and demographics, and impacts on growth forecasts
  - Best practice frameworks and procedures in conducting the policy forecast
  - Effective ways to communicate with subregions and local jurisdictions regarding policy impacts, policy forecasts (growth numbers), and regional growth policies and implementation instruments.

DEVELOPING THE PLAN ALTERNATIVES

2008 RTP/EIR BASELINE GROWTH FORECAST SCENARIO

The 2008 RTP/EIR Baseline Growth Forecast is a result of the Integrated Growth Forecasting process described previously. The regional growth totals were derived by analyzing historical population, housing and economic trends, and incorporating the future demographic rates and employment shift-share assumptions.

The Baseline Forecast would yield a growth scenario very similar to the status quo, taking a somewhat "business as usual" approach that is not steered by regional policies. Thus, for example, fast-growing suburban cities would likely continue to grow primarily through auto-oriented single family housing with commercial activities focused toward the highway system.

FORECAST DISTRIBUTION

Local jurisdictions were consulted for input regarding growth as part of the forecasting methodology. The following local input was used in developing the county and small area distribution of the forecast for the Baseline scenario:

- Imperial County: The 2035 consensus total population, household, and employment growth projections at traffic analysis zone (TAZ) and city levels were agreed upon by SCAG, IVAG, and Caltrans District 11.
- Los Angeles County: The 2035 total population, household, and employment growth projections at census tract and city levels provided by subregions and cities.
- Orange County: The Adopted 2006 OCP 2035 total housing and employment projections at census tract, city, and county levels as submitted by OCCOP.
- Riverside County: The 2006 RCP 2035 total population, household, and employment projections at census tract, city, and county levels provided by Riverside County Transportation and Land Management Agency (RCTLMA). This agency collected city level/census tract level input from local jurisdictions in Riverside County as agreed upon by RCTLMA, WRCOG, and CVAG.
- San Bernardino County: The 2035 household and employment projections at census tract, city, and county levels provided by SANBAG.

- Ventura County: The 2035 total population, household, and employment growth projections at census tract and city levels provided by VCOG.

SCENARIO ANALYSIS

SCAG's four-step transportation model suggests that the 2008 RTP Baseline Growth Scenario forecast distribution would, depending on the transportation network used in the model, result in an estimated range of 551.6 to 573.3 million Daily Vehicle Miles Traveled (VMT). The average person would drive 21.7 miles each day and would spend about 17.7 minutes in congestion (based on a total of 24,056,000 people and 7,126,245 hours of delay).

The performance of the 2008 RTP Baseline Growth Forecast is the basis upon which scenario comparisons are made to alternative forecast distributions.

SCENARIO-BUILDING AND THE RTP

DRIVING FORCES

Using the Baseline Growth Forecast as the control alternative, SCAG prepared a number of land use scenarios leading to four additional plan alternatives. Along with the population, employment and land use assumptions built into the Baseline Growth Forecast, numerous driving forces were considered. These represent influential trends or changes that are expected to occur within the timeframe of the plan. The RTP land use scenarios and subsequent alternatives were developed with these likely trends in mind in order to create the most plausible snapshots of the future.

1. Demographics

Most new growth in Southern California will come from the Latino population, with the growth of all ethnicities concentrated in the 15 to 34 and 55+ age groups. The 34 to 55 age group, which led the housing boom of the 1980s and 1990s will be relatively flat in the future. These shifts in population growth will create demand for a wider variety of housing types than are most prevalent today. Specifically, there will be more need for centralized infill housing and multi-family housing, which includes owned condominiums, townhomes and rental apartments.

2. Congestion will continue to increase regardless of feasible actions

Transportation modeling indicates that congestion in the region will increase from roughly 450,000 hours of delay per day currently to just less than 740,000 hours of delay in the year 2035. Driving will increase 32%, while the roadways and travel lanes will increase by only 2%. In the 1950s and 1960s new freeways had the effect of shrinking distances (perceived by time traveled), however increasing congestion has had the opposite effect today. As it worsens, key portions of our region will seem farther apart. With the network becoming more congested, the role of land use in bringing people closer to their destinations will become even more important.

3. Oil costs will likely continue to rise

In November 2007, the cost of oil rose close to $100 per barrel. If recent trends continue, oil prices may exceed $300 per barrel by 2035. In addition, experts have suggested that the world is at or near its peak in oil production. If they are correct, demand for oil will increase as production begins to decrease within the next decade.

4. Vacant land supply diminishing in viability

With the land in and near existing city centers largely developed, additional development in these areas is increasingly likely to occur through infill and higher density housing. Meanwhile, the region has a large supply of vacant land which primarily lies far from existing development. Combining distance with the increasing cost of travel (in both time and dollars), vacant land on the outskirts of cities is rendered less viable for housing and other development than it has been in recent history.

5. Land efficiency will increase

With several factors leading to higher demand for housing and jobs in and near existing centers, property owners will use their land more efficiently. Inefficient uses, such as large areas of free surface parking, will no longer be reasonable as property owners opt to use their land for larger economic gains. As parking begins to be priced to its true cost, travel behavior will be affected.

6. Funding for infrastructure

Southern California, along with most regions, is facing a discrepancy between increasing demands on its transportation infrastructure and the funding available for needed maintenance and expansion of the system. Current sources, whether federal, state or local taxes, cannot generate the revenue required to 'build' an infrastructure solution to the region's transportation and air quality challenges.

SCENARIO PLANNING

SCAG has pioneered the use of scenario planning in large-scale land use and transportation plans. This process was used to combine the regional forecast, additional driving forces and a range of policy options to formulate various RTP alternative scenarios to be modeled for transportation and land use performance and benefits.

Given the complexity of the environment, the numerous variables, and the planning horizon time frame, achieving the exact correct prediction is neither possible nor necessary. Rather, it is important to consider possible future scenarios - stories about what might be, not forecasts or predictions. The essential requirement of any scenario is that it be plausible, within the realm of what exists and what is now known. Also, the result of scenario planning is that strategies are developed that work well in the best-case scenario, and provide acceptable outcomes in the worst-case. These strategies are used to develop a vision for the area that can be implemented in several ways, allowing the flexibility to change as required.

In the process for developing the 2008 Plan Alternative, these scenarios serve as possible futures based on what already exists, and current and emerging trends, values and preferences in the SCAG region, as evidenced through workshops, stakeholder meetings, reality check analyses and on-the-ground demonstration projects.

BUILDING THE SCENARIOS

Using Envision Tomorrow GIS software, the land use model was developed for the 38,000 square mile area of the SCAG region. Beginning with a running inventory of land use, housing and employment, the software tracks information using 5-acre cells (the smallest level of geography available). Scenarios were then built by locating different development types (see Appendix D) on vacant and developed land while limiting development in environmentally constrained areas. The series of development types for Envision Tomorrow were created from a set of building types that represent residential, employment and mixed-use alternatives. The building types represent a wealth of data – from jobs and housing types to the mix of land uses to building height and parking requirements.

At their most basic level, development types represent households and employees for a given amount of land. In addition to this simple representation of density, information can be associated with these development types indicating many factors, such as the amount of impervious surface, percentage of rental units, single-family and multi-family mix, infrastructure costs, and other derived assumptions. Scenarios were populated using development types, allowing for direct comparisons between them via evaluation criteria such as land consumption, comparative infrastructure costs, and housing and job profiles. Jobs, population and housing from the scenarios were exported to traffic analysis zones (TAZs) for input to SCAG's transportation model.

Because the development type densities are based on vacant land, a set of standards is used to calculate the propensity of a certain development type to

redevelop. Areas such as Downtown are more likely to redevelop than Towns, while Centers are more likely to redevelop than Residential land. The redevelopment percentage is then multiplied by the employees and households per acre for vacant land to obtain a redevelopment density.

MODELING THE SCENARIOS

Through the use of robust computer planning tools, the scenario policies and development types were combined to create the virtual futures that form the test scenarios. The scenarios were designed to test a range of possible future outcomes, and engineered not as draft visions or plans, but as studies that could inform the creation of a draft plan.

The overall strategy in developing map layers to inform the scenarios was to identify developed, environmentally constrained and committed (publicly owned or tax exempt) land. The model assumes that publicly owned land is not available for either development or redevelopment, and removes it from developed and vacant inventories. Environmentally constrained land was also removed from the vacant land inventories. The resulting inventories of vacant and developed land are assessed for suitability for development and redevelopment, taking into account the land's proposed density and connection to infrastructure.

In addition to the detailed land use models that are used to both establish scenarios and monitor crucial themes such as types of jobs and housing and the amount of vacant land versus infill development, SCAG's transportation models use these scenarios as inputs. These models can measure the changes in land use, and in conjunction with current and planned infrastructure, determine how the region's travel will be affected by the future growth.

2008 RTP/EIR MODIFIED 2004 RTP GROWTH SCENARIO

The Modified 2004 RTP Growth Scenario represents one possible version of the region's growth between 2005 and 2035 based on the previously adopted 2004 RTP forecast distribution. This scenario's underlying policies are SCAG's Compass Blueprint Principles that were developed during the 2004 RTP process, with the continued expectation that growth be focused in a small portion of the region's land area, or the 2% Strategic Opportunity Areas defined during the 2004 visioning process.

COMPASS BLUEPRINT PRINCIPLES

According to the Compass Blueprint Principles, decisions regarding growth, transportation, land use, and economic development should be made to promote and sustain for future generations the region's mobility, livability, prosperity, and sustainability. These principles were first incorporated into the 2004 RTP, providing the foundation for the land use distribution of the adopted 2004 Plan. Since then, they have laid the foundation for implementing the vision and developing new regional policies for guiding growth in the Plan Alternative.

Improve mobility for all residents:

- Encourage transportation investments and land use decisions that are mutually supportive
- Locate new housing near existing jobs and new jobs near existing housing
- Encourage transit-oriented development
- Promote a variety of travel choices

Foster livability in all communities:

- Promote infill development and redevelopment to revitalize existing communities
- Promote developments that provide a mix of uses
- Promote "people-scaled," walkable communities
- Support the preservation of stable, single-family neighborhoods

Enable prosperity for all people:

- Provide, in each community, a variety of housing types to meet the housing needs of all income levels
- Support educational opportunities that promote balanced growth
- Ensure environmental justice regardless of race, ethnicity, or income class
- Support local and state fiscal policies that encourage balanced growth
- Encourage civic engagement

Promote sustainability for future generations:

- Preserve rural, agricultural, recreational, and environmentally sensitive areas
- Focus development in urban centers and existing cities
- Develop strategies to accommodate growth that use resources efficiently, eliminate pollution, and significantly reduce waste
- Utilize "green" development techniques

STRATEGIC OPPORTUNITY AREA UPDATES

In implementing the Compass Blueprint vision established in 2004, SCAG has continued to refine and update the 2% Strategic Opportunity Areas identified for the 2004 RTP. In this ongoing process, constant attention is paid to the evolving transportation system, and other developments that may alter the capacity of opportunity areas. SCAG continuously uses its workshops, stakeholder meetings and work in its demonstration projects to constantly refine and update the opportunity areas. This iterative process ensures that the assumptions are based on the best and latest available information from local decision-makers who deem them both reasonable and realistic.

FORECAST DISTRIBUTION

The Modified 2004 RTP EIR Growth Scenario represents a technically updated 2004 RTP Plan Forecast by controlling TAZ level data to the updated regional totals from the 2008 RTP Baseline Growth Forecast and extending the horizon year from 2030 to 2035. This scenario was used as the basis for an in-depth review during 15 map-based workshops in each of the SCAG subregions.

SCENARIO OUTCOMES

As compared to the Baseline Alternative, the 2008 RTP/EIR Modified 2004 RTP Growth Scenario Alternative showed a VMT reduction of 1.2%, a VHT reduction of 1.6% and a congestion delay reduction of 2.4% when modeled. Each of these estimates is per day in 2035, aggregated to the entire region.

2008 RTP/EIR WORKSHOP GROWTH SCENARIO

The 2008 RTP/EIR Workshop Growth Scenario was developed based on workshop input received using the Modified 2004 RTP Growth Scenario. In fall 2006, SCAG organized and facilitated workshops in each of its 14 subregions to update its consensus-built Compass Blueprint land use scenario. Specifically, the workshops sought to gather city and county input and comments regarding the Integrated Growth Forecast and the initial assessment of the population and employment capacity that the forecast reflects in the Modified 2004 RTP Growth Scenario.

The workshops were used to exchange information, establish potential areas of consensus, and identify areas where SCAG will need to revisit the forecast. This process served as one piece of the "reality check" for the growth forecast and the 2% opportunity areas identified to host future population and employment in the region.

Participants at the workshop focused on maps of the Modified 2004 RTP Growth Scenario and a simplified version of their general plans. Participants reviewed the scenario by making qualitative and quantitative comments ranging from general to specific. Numbered stickers were placed on the maps with accompanying matching numbers attached to a comment sheet where the input was recorded.

Over 400 participants (including planners and city officials) representing 157 cities and 6 counties within the SCAG region took part in the workshops. In all, fifteen half-day subregional workshops were held (one for each subregion, plus one additional workshop for Los Angeles County which covers eight subregions).

The workshops generated both regionally thematic and locally specific input. This input, applied to the Modified 2004 RTP Growth Scenario provides the framework for the Workshop Scenario. Following is a brief summary of the regional themes expressed and considered in making the adjustments for this scenario.

- Often, the long-term forecast and distribution were deemed appropriate and realistic.
- The 2035 horizon date created some challenges in imagining future land use patterns. The sub-regions are all expecting significant growth and are particularly concerned with this growth in the near term.
- Areas that already have urban and high density development types are most open to increased mixed-use and higher density. This is especially true for those with existing transit corridors.
- Cities that are primarily made up of single-family homes today are looking toward more intense single-family development. However, they may not yet have the desire (or demand) for urban-style mixed-use projects.
- Jobs/housing balance was a key issue, along with affordable housing for workers.
- Focusing job growth closer to higher intensity nodes, as reflected in local plans.
- Transit corridors and nodes were identified for additional development.
- In subregions that considered themselves "built-out", focus was on infill in centers and corridors.
- Some subregions supported higher growth in fewer areas than originally defined in the vision.
- Low density housing was deemed inappropriate in some outlying hillside areas.
- Some subregions asked SCAG to refer to their own work with regard to forecasting and visioning.

SCENARIO OUTCOMES

Using the input from the workshops, SCAG developed the Workshop Growth Scenario. The Workshop scenario was provided to the transportation modeling team and modeled to gauge performance of the transportation network.

In general, this scenario showed benefits in some counties but problems in others. Fast growing areas where the participants were less enthusiastic about compact growth and infill appeared to under perform from a transportation standpoint.

The lessons learned from the modeling results were used in the development of subsequent land use scenarios. And the local input regarding the long-term growth distribution was used throughout the alternative development process.

As compared to the Baseline Alternative, the 2008 RTP/EIR Workshop Growth Alternative showed a VMT reduction of 1.1%, a VHT reduction of 1.5% and a congestion delay reduction of 2.4% when modeled. Each of these estimates is per day in 2035, aggregated to the entire region.

TRANSIT ORIENTED DEVELOPMENT AND EMPLOYMENT CENTERS

The Workshop Scenario showed some improvements to travel patterns, but also highlighted some difficulties inherent in building a network for moving people around the region. The Transit Oriented Development (TOD) and Employment Centers scenarios were developed to test a range of policies and identified trends. Neither scenario was intended to represent a final alternative. Rather, modeling the two scenarios provided insight that was used in further scenario building and alternative development.

The tests were based on applying the Compass Principles to the Workshop scenario to a greater degree than they were in the 2004 RTP or in the Modified 2004 RTP Growth Scenario. Adjustments were made based on the following:

- The workshop scenario, with housing and job densities in mixed-use areas adjusted region-wide would serve as the starting point for the component scenarios.
- Detailed land use adjustments were made only to the areas identified by SCAG as "TOD" and "Employment Centers". Adjustment of TAZs outside of TODs and Employment Centers was made mathematically to meet regional housing unit control totals. Trip origin TAZ data formed the basis for required reductions. For example, TAZs with high amounts of long trips had housing reduced at a greater level than TAZs with low amounts of long trips. For employment, a factor was applied region-wide to meet regional control totals.
- The scenarios did not rely on the use of county or city control totals, relying only on regional controls.
- The team was very conservative about designating new lands for growth instead focusing on increasing intensity of the previously identified growth areas. This approach enabled the team to maintain the overall land use footprint from the subregional workshops.

Region-wide density and infill adjustments were made to increase housing density and the number of housing units in mixed use areas. Adjustments were made to the infill rates and housing and employment densities for five mixed-use development types (see Appendix D for more detail on development types):

- Transit Station
- Transit Corridor
- Town Center
- City Center
- Main Street

In developing the scenario, housing unit density in each of these development types was increased, and where necessary, employment densities for each development type were adjusted to maintain a reasonable jobs/housing balance. This approach resulted in an increased housing unit density in mixed use areas without having to change the spatial distribution that was provided, and agreed upon, by local governments through the workshop process. Additional housing and employment was added to these areas assuming a higher rate of infill and density.

TABLE 6 INFILL RATE CHANGES

	Infill Rate		
	Workshop	Adjusted	Increase
Transit Station	35%	50%	15%
Transit Corridor	25%	30%	5%
Town Center	25%	40%	15%
Main Street	35%	35%	0%
City Center	30%	40%	10%

TABLE 7 HOUSING DENSITY CHANGES

	Housing Units/Acre		
	Workshop	Adjusted	Increase
Transit Station	25.5	63.3	37.8
Transit Corridor	15.4	22.5	7.1
Town Center	24.3	40.8	16.5
Main Street	16.1	27.1	11.0
City Center	25.9	44.2	18.3

TABLE 8 EMPLOYMENT DENSITY CHANGES

	Employment/Acre		
	Workshop	Adjusted	Increase
Transit Station	9.7	12.0	2.3
Transit Corridor	7.9	8.2	0.3
Town Center	27.9	35.4	7.5
Main Street	17.0	25.7	8.7
City Center	81.9	121.7	39.8

These infill rate and density adjustments yielded additional capacity of over 752,000 housing units and 551,000 jobs to the mixed-use development types.

Transit Oriented Development Area

Using these adjusted densities and infill rates as a starting point, the scenario focused on increasing housing growth near transit station areas. SCAG identified three different types of transit station areas for this analysis:

- Bus Rapid Transit (BRT)
- Metro Rail (Light Rail)
- MetroLink (Commuter Rail)

Each transit station area type has different characteristics and impacts. Adjustments were based on the type of station area, its location within the region and its proximity to employment areas. Each TOD location includes the land within a 1/3 mile buffer around the station.

The Envision Tomorrow scenario building software, used to conduct the allocation process relies on the use of a 5.5 acre grid cell. Thus, in order to maintain consistency, all grid cells within .05 miles of every TOD buffer identified by SCAG were selected as the basis for the TOD allocation changes. The following section describes the basic methods applied to adjust individual TOD areas. It should be noted that in addition to these basic methods, adjustments were also made using professional judgment and planning experience to ensure as much consistency with the subregional workshop input as possible.

Station Specific Changes

Bus Rapid Transit (BRT) – For BRT stations, more housing capacity was added within these areas and within the corridors located inside of the TOD area. In most cases, BRT TOD sites with a Transit Corridor development type were selected and replaced with the higher intensity Transit Station development type. This resulted in the addition of more housing within these TOD locations.

Light Rail – Similar to the BRT stations, more housing capacity and service-related employment was added to these areas. These areas will likely attract local service-related trips and should provide more opportunity for local residents to walk to services needed on a daily basis. In most cases Light Rail TOD sites with a City Center development type were selected and replaced with Transit Station development type. In addition, areas within a Light Rail TOD area with the Transit Corridor development type were replaced with the higher intensity Transit Station development type. This allowed for more housing capacity in these areas, and reduced some of the existing job distribution - as the City Center development type is more intense for jobs as compared to the Transit Station development type.

Commuter Rail – Additional housing capacity was added to these station areas. In most cases Commuter Rail TOD sites with a Transit Corridor development type were selected and replaced with Transit Station development type. This resulted in the addition of more housing within these TOD locations.

Region-wide Balancing

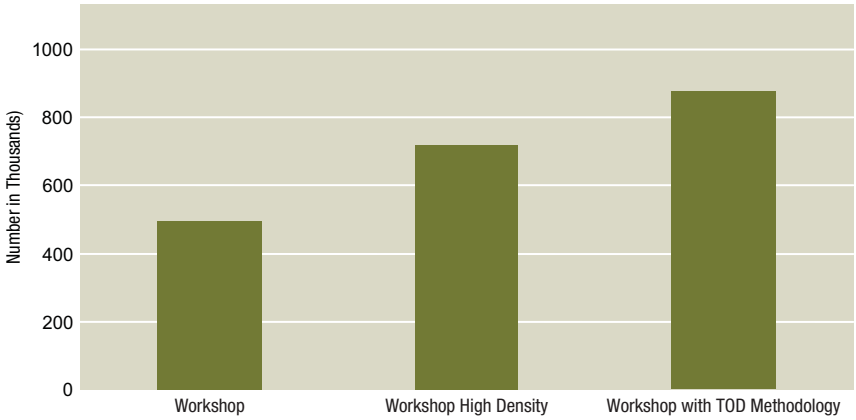
The adjustments made to the TOD scenario resulted in an increase of housing and employment over the region-wide forecast. The regional totals for non-TOD TAZs were adjusted in order to remove the equivalent number of housing and jobs from TAZs outside of Strategic Opportunity Areas. Housing and employment were reduced in locations where 2003 TAZ data showed long trips originating from given TAZs. Non-TOD TAZs were identified with trips originating in the morning peak that were greater than 50 miles. Trips greater than 50 miles are considered to be "long distance commutes"; this process focused on reducing as many long distance commutes as possible. The following table shows the parameters that were used to conduct the reductions.

TABLE 9 TAZ REDUCTIONS BY PERCENT OF ORIGIN TRIPS GREATER THAN 50 MILES

Percentage of trips originating from TAZ greater than 50 miles	Percent reduction in housing increment
40%	100%
30%	100%
20%	100%
15%	95%
10%	90%
5%	60%
0%	10%

Figure 9 shows the number of housing units within TOD area TAZs under the original workshop scenario, the workshop scenario with adjusted densities, and the higher density workshop assumptions with the TOD methods applied.

FIGURE 9 HOUSING UNITS IN TOD TAZS



As shown, increasing the densities for the mixed-use development types had a significant impact on housing unit capacity in TAZs. Housing unit capacity in TOD TAZs increased by 224,410 as a result of the density changes. The changes in TOD areas, as described above, resulted in an increase of 158,315 housing units above the higher density version of workshop scenario.

Employment Centers

Using the adjusted densities and infill rates as a starting point, this scenario focused on increasing housing growth near Employment Centers. SCAG identified 583 TAZs as Employment Centers that, by 2035, will have at least 10 employees per acre and have at least 10,000 employees. The TAZs that share a common border with the 583 centers were also identified as potential areas for additional housing, given their close proximity to job centers. The following changes to the identified TAZs:

- Areas within the selected TAZs that were designated as the City Neighborhood development type were changed to the Town Residential development type.
- Areas within the selected TAZs that were Town Residential (prior to the above change) were changed to City Residential development type.

These changes resulted in increasing the distribution of housing in Employment Center TAZs, while maintaining existing employment numbers to the furthest extent possible.

Region-wide Balancing

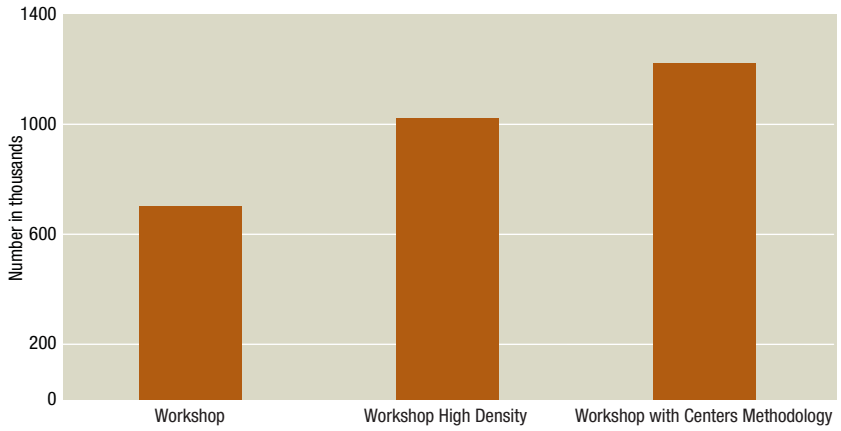
The adjustments made to the Employment Centers also resulted in an increase of housing and employment over the region-wide forecast. Regional totals for non-Employment Center TAZs were adjusted in order to remove the equivalent number of housing and jobs from non Strategic Opportunity Area TAZs, using the same long trip methodology as in the TOD scenario.

TABLE 10 TAZ REDUCTIONS BY PERCENT OF ORIGIN TRIPS GREATER THAN 50 MILES

Percentage of Trips Originating from TAZ that are greater than 50 miles	Percent housing reduction from growth increment
40%	100%
30%	100%
20%	100%
15%	95%
10%	90%
5%	50%
0%	20%

The following chart shows the number of housing units within Employment Center TAZs under the original workshop scenario, the workshop scenario with adjusted densities, and the higher density workshop assumptions with the Employment Center methods applied above.

FIGURE 10 HOUSING UNITS IN EMPLOYMENT CENTER TAZS



As shown, increasing the densities for the mixed use development types had a significant impact on housing unit capacity in Employment Center TAZs. The density changes resulted in an increase of 322,537 additional housing units in

Employment Center TAZs. The changes in Employment Centers as described above resulted in an additional increase of 193,915 housing units in Employment Centers above the higher density workshop scenario base.

SCENARIO OUTCOMES

The TOD and Employment Centers test scenarios were run through SCAG's transportation model. The combination of higher densities and more infill resulted in significant improvements over both the Modified 2004 RTP Growth Scenario and the 2008 RTP Baseline Growth Forecast.

Modeling of the TOD test scenario showed potential reductions in VMT and hours of delay. Compared to the 2008 RTP Baseline Growth Forecast, the TOD and Centers land use scenarios save the region 19.8 and 23 million miles of daily travel respectively. Daily vehicle hours of delay in the TOD and Centers scenarios were reduced by 410,000 and 530,000 hours respectively, compared to the Baseline scenario.

2008 RTP/EIR ENVISION GROWTH SCENARIO

The degree of benefit from the TOD and Employment Center scenarios showed a great deal of promise, leading to their incorporation in the development of the 2008 RTP/EIR Envision Growth Scenario. The Envision scenario focused on bringing together the best parts of these test scenarios to assess the full impacts of housing density changes within TOD locations and Employment Centers.

The first step in development was bringing together the two test scenarios to create a single format from which a new allocation, or growth distribution could be developed. Both scenarios were based on the workshop input with the adjusted densities and infill rates. Therefore, in all areas, besides the TOD and Employment Centers TAZs, the input was consistent.

In those TOD and Centers areas that were different, specific parameters were applied to ensure that:

- Employment Centers maintained their employment distribution;
- Additional housing added within the Employment Center, or directly adjacent to the Employment Center, were maintained from the Centers scenario;
- Additional housing was maintained from the TOD scenario.

FORECAST DISTRIBUTION

Bringing together two scenarios required tradeoffs in specific circumstances. Specifically, in cases where a TOD area overlapped an Employment Center, development types within the Employment Center were prioritized.

Also, in cases where TODs did not overlap with Employment Centers, the TOD scenario development types replaced the Workshop Scenario. For example, TOD TAZs in the Workshop Scenario would be lower than the TOD TAZs in the TOD scenario. Thus, development types within the TOD Scenario replaced those of the Workshop Scenario. The same method was applied to the TAZs adjacent to the Employment Centers.

Combining test scenarios and including the region-wide density adjustment resulted in a county level distribution that varied greatly from the distribution achieved through the subregional workshop process. In several cases, the county level numbers would be counter to both local and regional planning efforts. Accordingly, the team adjusted county-wide control totals by making adjustments to the workshop control totals that were consistent with the goal of the scenario in order to focus density in TOD areas and Employment Centers.

Reduce Housing and Employment Where Needed

Using the Envision Tomorrow software, the following analysis was conducted on a county by county basis. The starting point for this scenario required that the team adjust development types, and reduce growth in specific areas. As a result of the increased housing densities, additions to Employment Centers and TODs led the Envision Scenario to have approximately 1 million more

housing units, and 765,000 more jobs than called for in the region-wide forecast. A strategic approach was applied to reduce housing and employment in areas where there would be the greatest beneficial impact on transportation.

Four main sources were used to help guide the reductions:

- Existing General Plans
- Workshop Input and Comments
- Long Distance Trips (TAZ Origin Data)
- Potential Housing Opportunity Areas – these are areas where the land use shows it is either multi-family (condominiums, townhomes and rental apartments), mixed use or commercial and did not have new additional growth added as part of the workshop exercise.

Two main approaches were used to conduct the initial reduction of housing and employment. These approaches helped to reduce most of the housing and employment numbers for most counties needed to reach the regional totals (except LA County). It is important to note that the reductions listed below were only applied to the growth increment – in effect bringing the scenario increment to equal the regional growth increment of the workshop scenario. In no case was existing development removed and no areas were designated to receive negative growth. These approaches were to:

- Remove suburban development types from these areas such as Residential Subdivision, Large Lot and Rural Development Types. This approach helps support the increase of housing density and reduce Vehicle Miles Traveled (VMT) by removing most housing in areas that generated long trips, instead locating that housing closer to employment areas and transit locations.
- Remove the Transit Corridor Development Type from areas outside identified TOD locations. This approach supports a more nodal approach to transit oriented development and is consistent with stakeholder input and the Compass Blueprint "reality check" research, calling for more nodal development and less corridor density. The increases in overall densities, as well as the increase in housing within TODs, helped to establish a more nodal TOD area. Reducing transit corridor development type near TOD locations, particularly within more suburban locations, provided a logical approach to reducing housing to reach the regional control totals.

Table 11 shows the housing and employment numbers for TOD areas under the Envision scenario compared to the TOD Scenario:

TABLE 11 HOUSING IN TOD AREAS UNDER ENVISION SCENARIO

Scenario Name	Housing Units in TOD Areas
TOD Scenario	875,123
Envision	810,990
Difference	64,133

As seen, there is a difference of 64,133 units between the two scenarios, likely due to the priority given to the Centers scenario in order to maintain the jobs distribution within these centers.

Table 12 shows the housing and employment numbers for Employment Center areas under the Envision scenario compared to the Centers Scenario:

TABLE 12 HOUSING IN EMPLOYMENT CENTER AREAS UNDER ENVISION CENTER

Scenario	Housing Units in Centers Areas
Centers	1,220,166
Envision	1,121,816
Difference	98,350

There is a difference of 98,350 new housing units within these TAZs. Changes to land uses to maintain jobs within these centers likely had the most effect on reducing this total.

The results in Table 13 appeared the most promising with regard to the regional totals for housing units within all TOD and Employment Centers TAZs:

TABLE 13 HOUSING UNITS WITHIN ALL TOD AND EMPLOYMENT CENTERS TAZ

Envision Scenario	Totals for all Employment Centers and TOD Areas
Housing units	1,367,432
Employment	1,745,273

Over half of the incremental growth of housing units and nearly half the growth in Employment are now within TOD or Employment Center TAZs.

Scenario Outcomes

The Envision Growth Scenario was tested via SCAG's four-step transportation model. As expected, combining the strategies of the TOD and Centers test scenarios resulted in benefits greater than either scenario had provided alone.

The Envision Scenario offers a reduction of 31.3 million miles of daily VMT. This is a significant reduction, though not as large as one might expect from the combination of the two test scenarios due to a point of diminishing return. That is, once the major changes in density and infill had been made, further redistribution of growth into the mixed use areas began to have less transportation benefit.

Direction gleaned from this analysis suggested a 2008 Policy Growth Forecast that would capture the majority of the benefit of the Envision EIR Growth Scenario without going to unrealistic lengths of focusing development. In other words, the best scenario would retain the consensus input of the Workshop Growth Scenario, while importing the mixed use and infill strategies in specific TOD and Centers areas.

POLICIES

Certainly, the Plan Alternative could simply incorporate current land use trends based on the forecasting process described above. However, in the rapidly growing SCAG region, these trends must be tempered, and in some cases bolstered, by policies and programs designed to improve future travel patterns and vehicle emissions.

Based on the land use assumptions built by SCAG and its local partners, the Regional Council adopted the following set of policies to be incorporated into Compass Blueprint and used in developing the Plan Alternative. These policies were founded upon the Compass Principles developed through the regional growth visioning efforts in preparation for the 2004 RTP. Refinements were made in accordance with changing dynamics in the region, as well as stakeholder discussions, demonstration project results, workshop input and the "reality check" analysis done throughout the region. SCAG also sought the input of its Compass Partnership[1] to use their expertise and understanding of the region to assess whether policies would be feasible given the often competing interests and resources of cities, developers and residents. The following policies proved both regionally beneficial relative to their transportation performance, and in tune with the emerging public policy, development patterns and community needs throughout the region:

- **Identify regional strategic areas for infill and investment**

  Identify strategic opportunity areas for infill development of aging and underutilized areas and increased investment in order to accommodate future growth. This strategy makes efficient use of existing and planned infrastructure, revitalizes communities, and maintains or improves quality of life. Strategic areas are primarily identified as those with potential for: 1) transit-oriented development (TOD); 2) existing and emerging centers; 3) small mixed use areas.

[1] The Compass Partnership is a voluntary stakeholder committee, including elected officials, business leaders, real estate developers, policy experts and advocacy groups, that meets regularly to discuss and review Compass Blueprint policies, programs and activities, in order to provide multiple, on-the-ground perspectives and input on all activities and plans, such as the Regional Transportation Plan.

- **Structure the plan on a 3-tiered system of centers development**

  Identify strategic centers based on a 3-tiered system of existing, planned, and potential, relative to transportation infrastructure. This strategy more effectively integrates land use planning and transportation investment.

- **Develop "complete communities"**

  Create mixed use districts or "complete communities" in strategic growth areas, through a concentration of activities with housing, employment, and a mix of retail and services, located in close proximity to each other. Focusing a mix of land uses in strategic growth areas creates complete communities wherein most daily needs can be met within a short distance of home, providing residents with the opportunity to patronize their local area and run daily errands by walking or bicycle rather than by automobile.

- **Develop nodes on a corridor**

  Intensify nodes along corridors with people-scaled, mixed use developments. Many existing corridors lack the residential and commercial concentration to adequately support non-auto transit uses, without which the existing transit system cannot fully realize its potential for accommodating additional trips and relieving the transportation system. These nodes along the corridor also create vibrant, walkable communities with localized access to amenities, further reducing reliance on the automobile for a variety of trips.

- **Plan for additional housing and jobs near transit**

  Plan for additional housing and jobs within reach of the transit network. Pedestrian-friendly environments and more compact development patterns in close proximity to transit serve to support and improve transit use and ridership. Focusing housing and employment growth in transit accessible locations through this transit-oriented development approach will serve to reduce auto use and support more multi modal travel behavior.

- **Plan for a changing demand in types of housing**

  Plan for changing demographics and subsequent impacts on the region's economic future. Shifts in the labor force, as the large cohort of aging "baby boomers" retire over the next 15 years and are replaced by new immigrants and "echo boomers", will likely induce a demand shift in the housing market for additional development types such as multi-family (condominiums, townhomes, rental apartments) and infill housing in central locations, appealing to the needs and lifestyles of these large populations.

- **Continue to protect stable existing single family areas**

  Continue to protect stable existing single family neighborhoods as future growth and a more diverse housing stock are accommodated in infill locations near transit stations, in nodes along corridors and in existing centers. Concurrently, focusing growth in central areas and maintaining less development in outlying areas, preserves the housing option for large-lot single family homes, while reducing the number of long trips and vehicle miles traveled to employment centers.

- **Ensure adequate access to open space and preservation of habitat**

  Ensure access to open space and habitat preservation despite competing quality of life demands driven by growth, housing and employment needs, and traditional development patterns. Development patterns that focus growth in centers and corridors make the most efficient use of developed land and minimize encroachment on public open space and natural habitat. This approach would ensure improved access to existing large-scale and neighborhood-scale open space.

- **Incorporate local input and feedback on future growth**

  Continue public outreach efforts and incorporate local input through the Integrated Growth Forecast. This innovative approach provides a more accurate forecast that integrates future land use and transportation planning through growth projections for population, employment, households and housing units. Public workshops, scenario planning,

and stakeholder outreach improve the accuracy and feasibility of pursuing regional plans at the local level.

- **Promote land use patterns supportive of goods movement and logistics industries**

  Promote growth and land use patterns that support regional economic development, namely the goods movement and logistics industries. Plans should focus these new industries apart from existing residential areas, while land use patterns around existing logistics centers should be reconfigured to minimize adverse environmental and health impacts.

POLICY CONTEXT

A contextual analysis is essential in the application of these policy recommendations given differences in geography, urbanization, population and employment growth, and transportation infrastructure. Similarly, the policies reflect current development patterns in some portions of the region and nascent planning strategies in others. In the broad context, the SCAG region can be viewed through two lenses: the highly urbanized basin area of Los Angeles, Orange and Ventura Counties and the growing periphery of north Los Angeles, north and east San Bernardino, Riverside and Imperial Counties. The recommended policies apply to each of these contexts differently, requiring a deeper understanding of the growth dynamics at play in each.

Urbanized Basin: The highly urbanized portions of the SCAG region are well-suited for the conventional application of the policies outlined above. These areas are highly urbanized, with older central cities surrounded by suburbs turned edge cities that are beginning to experience similar challenges of aging and congested transportation infrastructure, declining economic and industrial bases, and quality of life concerns.	**Growing Periphery:** The periphery with its rapid growth and large expanses of undeveloped land requires special application of the growth policies. These areas have been primarily developed as subdivisions of large single family homes surrounding rural and agricultural lands. The challenges facing these portions of the region include long commutes, a lack of walkable communities, and disconnected developments.

The following are specific examples of the distinctions that would occur in the application of the Compass Blueprint growth policies in urbanized and peripheral areas:

Infill development is essential given a lack of available land, and as a means of revitalizing aging and declining cores.	**Infill development** is an important strategy in these areas, needed mostly in aging downtown/main street areas that have been overlooked in recent years.
Transit-oriented Development is the key given existing transit investments that should be maximized and enhanced in order to alleviate congestion and provide increased access to more people.	**Jobs-oriented Development** would be the alternative in these areas where transit is not yet available. Improvements to the jobs/housing balance and proximity is needed, as well as an overall focus on job creation. Still, appropriate densities should be placed in areas planned for future transit.
Existing centers serve as nodes along corridors wherein a mix of jobs, housing and services can help to create more walkable, complete communities that improve congestion as well as quality of life.	Focus is on potential and planned centers for a mix of jobs, housing and services to create mixed-use districts. Improving connections between subdivisions and communities
A wide range of housing options for all life stages and lifestyles offers opportunities for multi-family developments near transit and jobs, thereby increasing transit mode share and walkability in mixed use communities.	Primarily single family homes built for young families moving to the area, additional housing options will fit the population's future needs for young adults and retirees looking for alternative lifestyles, closer to amenities.

REALITY CHECK

In 2006 and 2007, SCAG partnered with seven jurisdictions targeted for change in the Compass Blueprint to conduct another Reality Check that sought to determine local general plan consistency with Compass Blueprint Principles and the workshop scenario. The results of this Reality Check were used along with regional growth policies adopted by the Regional Council as input to the 2008 RTP growth scenario and to improve implementation of Compass Blueprint. For practical reasons, jurisdictions selected to participate had recently updated General Plans and Environmental Impact Reports (EIRs) so that currently analyzed data and public input would be available. Taken together, these jurisdictions represented and could convey conditions likely to exist across the region.

A land use capacity analysis was conducted that compared city general plan build-out with the workshop scenario projections at two geographic scales: citywide and at the TAZ level. This was followed by an in-depth study of major and minor employment centers and potential transit-oriented development areas. SCAG was able to conclude based on these studies that recently updated city general plan documents are consistent with the Compass Blueprint Principles. The cities analyzed in the Reality Check are adopting policies in their general plans that focus growth primarily in centers, but also at nodes along key corridors at densities significantly higher than the workshop scenario.

Most importantly, SCAG has found that a paradigm shift is occurring regionwide, with most cities that are undertaking General Plan updates moving towards adopting similar policies and zoning ordinances consistent with the Compass Principles and Growth Vision. This regional movement is not only encouraging, but essential to fully realizing the Plan Alternative through specific land use policies and strategies that are adopted and enforced by local jurisdictions.

THE 2008 RTP POLICY GROWTH FORECAST ALTERNATIVE

The foundation of a successful Plan Alternative must be built using the lessons learned through detailed scenario modeling and analysis. Fundamental among the "scenario outcomes" is that the physical limits on developable land coupled with continued growth will necessitate finding new ways for the region to grow. Changing demographics, rising fuel costs and efforts toward sustainability mean that cities and developers will need to look more toward mixed-use development and locating new jobs and houses in developed areas capable of supporting additional growth.

The region is rich with efficient and well-connected centers and corridors. These are prime areas where investment in infrastructure can act as a catalyst to focus growth. Development in these areas provides residents with many options for travel – from foot to bus to car – and minimizes reliance on scarce vacant land. Transportation modeling has shown that intensification, along with a mix of uses in these areas, has a great effect on reducing regional congestion and the need for travel by car.

The strategy of combining compact, mixed-use development with housing and jobs near major transportation infrastructure proved to be of enormous benefit in accommodating future growth. The scenario modeling and the "Four Ds" transportation analysis (see Appendix C) shows much evidence that a reduction in vehicle driving occurs in areas where land use and transportation are integrated and densities are higher.

From a modeling standpoint alone, there is an incentive to move the Envision Scenario forward as the draft plan. However, it does not necessarily represent a story about growth that could be readily feasible in the short term. While indeed plausible, achieving the forecast distribution of the Envision Scenario would require significant efforts at the local and regional level. Additionally, modeling showed that the combination of TOD and Centers as strategies in the Envision Scenario began to reach a point of diminishing returns. Thus, the 2008 RTP Policy Growth Forecast Alternative should strive to incorporate

TABLE 15 COUNTY-LEVEL GROWTH-BASELINE ALTERNATIVE AND POLICY GROWTH FORECAST ALTERNATIVE

County	Baseline		Plan		Change	
	HH	EMP	HH	EMP	HH	EMP
Imperial	103,000	133,000	101,000	132,000	(2,000)	(1,000)
Los Angeles	4,003,000	5,041,000	4,087,000	5,091,000	84,000	50,000
Orange	1,118,000	1,982,000	1,134,000	1,991,000	16,000	9,000
Riverside	1,183,000	1,414,000	1,142,000	1,387,000	(41,000)	(27,000)
San Bernardino	973,000	1,255,000	914,000	1,220,000	(59,000)	(35,000)
Ventura	330,000	463,000	334,000	466,000	4,000	3,000

the best-performing elements of the scenario exercise into a realistic representation of future growth.

TENETS OF THE 2008 RTP POLICY GROWTH FORECAST ALTERNATIVE

The primary tenets of the 2008 RTP Policy Growth Forecast are the ten regional growth policies discussed in the preceding section. In addition to these policies the land use distribution is also informed by the results of research performed at a local scale during 2006 and 2007. The primary sources of this research include dozens of Compass Demonstration Projects, where SCAG supported local planning initiatives consistent with these regional goals, and a "reality check" process to explore, in depth, the relationship between local general plans, the RTP and recent demographic trends.

A summary of the primary tenets include:

- Improve the localized balance between jobs and housing
- Increase potential transit ridership by focusing growth to transit supportive areas – LRT, BRT, Metrolink
- Enhance existing and emerging employment and residential centers
- Shift the balance of new development from low density single-family housing to mixed-use and higher density housing
- Maintain stable single-family areas
- Minimize new separate use commercial or residential development in outlying areas
- Minimize very high density development in areas that are not effectively served by transit or are not within identified employment centers

DEVELOPMENT OF THE 2008 RTP POLICY GROWTH FORECAST ALTERNATIVE

Development of the 2008 Policy Growth Forecast began with the Workshop Scenario, which represented the closest representation available of regional consensus on how and where growth should occur. Modeling indicated that the scenario had some performance benefits but also would result in increased congestion in some areas. Additionally, not all counties saw benefits. One of the techniques that showed promise was to utilize much of the thematic distribution specified by the participants while making some changes to the county-level forecast distribution.

County Level Adjustments

The input at the Subregional Integrated Growth Forecast Workshops resulted in a county level distribution of the forecast that was similar to the Modified 2004 RTP Alternative. In testing the Envision Scenario, adjustments were made

to the county level distribution in an attempt to enhance regional jobs/housing balance. The theory is that by adding housing to jobs-rich counties, such as Orange and urbanized Los Angeles, trip lengths to work and errands could be reduced. The risk of these adjustments is the potential stress on existing infrastructure capacity. Modeling confirmed this concern in both Orange and Ventura counties. For these two counties, the 2035 housing unit assignment was decreased somewhat; however, it remained higher than the Baseline.

In Los Angeles County, the Envision Scenario analysis showed significant additional capacity in areas near both transit and auto infrastructure and near existing employment centers. As a result Los Angeles County received an additional 84,000 households compared to the Baseline Alternative. To compensate for the additional housing growth directed toward these employment and transit-served areas, the housing-rich Counties of Riverside and San Bernardino both received a reduction in forecast households. To adjust the employment rate appropriately, service jobs were reduced at a rate of one-half job per household removed; however, no base employment was shifted between the counties.

The following table compares the county-level distribution of growth between the Baseline Alternative and the Policy Growth Forecast Alternative. HH represents total households in the year 2035 and EMP represents the total number of jobs in 2035.

Small Area Adjustments

Input at the workshops in many cases resulted in a more compact and transportation efficient pattern of development than in either the Baseline or the Modified 2004 RTP Growth Scenarios. The local knowledge was critical in documenting so called "pipeline" development that is either already underway or has gone significant distance toward entitlement. These pipeline projects are all but guaranteed to happen; the workshops provided a mechanism to make certain that they would be accounted for in the RTP. Still, there were situations where existing local policies did not take full advantage of public investment in transit and/or centralized locations. The goal in developing the 2008 RTP Policy Growth Forecast was to build a scenario that is consistent with local policies while taking advantage of potential efficiencies that might be otherwise overlooked.

CAPTURING THE BENEFITS OF THE ENVISION SCENARIO

The modeling of the Envision Scenario, and its accompanying TOD and Centers Scenarios clearly demonstrated the significant benefits possible by better aligning future land use with areas both well-served by transit and those that are current job destinations. Working selectively, components of the Envision Scenario were added to the Workshop Scenario in a manner consistent with the adopted land use policies.

The goal was to add mixed-use and higher density development types to areas with excellent connectivity and access to the transit network or proximity to job centers. For the three tiers of transit stations (Light Rail, BRT and Metrolink) densities and the amount of expected infill were increased.

Light Rail stations and the surrounding ½ mile vicinity were designated with development types such as Transit Center, and Main Street to provide a greater share of mixed use and an increase in housing units over jobs – the primary goal was to add housing. In station areas coinciding with urban centers the City Center and Downtown Center design types were utilized.

Bus Rapid Transit (BRT) stations were treated similarly; however, densities were lower and the geographic extent was smaller. The Transit Center and City Neighborhood designations were most likely utilized. Similar to the Light Rail stations, these areas are intended to capture additional housing and provide the residents with quick and easy access to jobs, shopping and errands.

Metrolink stations are showing emerging potential. Unlike Light Rail and BRT these stations have a larger capture area and need to provide a full range of services, housing and employment. For areas nearest to the stations housing-rich design types such as Transit Station were applied. In near proximity, design types with a greater mix of uses, such as Town and Main Street were

utilized. Radiating out from the station a bit farther and City Neighborhood, a moderate density residential design type would be present.

One of the primary goals of adding components of the Envision Scenario was to enhance existing and emerging centers. Areas that contain at least 10,000 existing employees at an average density of 10 jobs per acre or greater were the focus of this effort. Based on the principles set forth, the intent was to add additional housing opportunity to these areas. In addition to the job centers themselves, nearby areas that were either designated as multi-family by general plans, or were both vacant and residentially designated were targeted with moderate and higher density housing. For the smaller job centers, efforts were made to convert them to more complete communities with a mix of housing, jobs and shopping. The mixed use design types were often used in these circumstances.

A final feature of the Policy Growth Forecast Alternative is that density without appropriate accessibility is not incorporated. While higher density housing may be helpful in the effort to minimize urban expansion, located in isolation without nearby access to jobs, services and shopping provides no significant transportation benefit. Unlike mixed use areas where people have been observed driving shorter distances and less often, isolated residential development, regardless of density, requires its residents to drive their automobiles for nearly all trips. Growth in these areas was minimized and redirected to mixed use, transit efficient areas.

Direction gleaned from this analysis suggests a Policy Growth Alternative that captures the majority of the benefit of the Envision Scenario without unrealistic assumptions should be the goal. The optimal scenario would retain the consensus input of the Workshop Growth Scenario, while importing the mixed use and infill strategies in specific TOD and Centers areas as appropriate. The 2008 Policy Growth Alternative achieves these objectives.

PLAN PERFORMANCE

The 2008 RTP is driven by State and Federal mandates as well as performance goals adopted by SCAG's Regional Council. Due to limited financial resources, SCAG must seek innovative strategies to meet these goals and requirements. The Compass Blueprint is a primary instrument used to achieve these objectives through better integrating land use and transportation investment decision-making.

SCAG's transportation model provides a validated method of measuring transportation performance criteria of varied land use assumptions. This section provides a summary of performance results for selected mobility indicators. The performance is measured by comparing the 2008 RTP Baseline Growth Forecast Alternative (no regional growth policy) and the 2008 RTP Policy Growth Forecast Alternative. Each Alternative was modeled using the Plan Transportation Network (see the 2008 RTP Project List Report), thus isolating benefits due to land use assumptions contained in each alternative.

The modeling results reveal significant mobility benefits due to the regional land use strategies in the Policy Growth Forecast Alternative. The following tables clearly illustrate these results for select variables (for additional modeling analysis and results refer to the 2008 RTP Plan Performance Supplemental Report).

TABLE 15 DAILY VEHICLE MILES TRAVELED (VMT) IN 2035

	(In Thousands)			
County	2008 RTP Baseline Growth Forecast Alternative	2008 RTP Policy Growth Forecast Alternative	2008 RTP Plan Benefits	2008 RTP Plan Benefits Percentage
Imperial	11,624	11,194	-430	-3.7%
Los Angeles	259,852	254,324	-5,528	-2.1%
Orange	85,575	86,377	802	0.9%
Riverside	85,069	80,457	-4,612	-5.4%
San Bernardino	97,871	92,808	-5,063	-5.2%
Ventura	23,336	23,072	-264	-1.1%
SCAG	563,327	548,232	-15,095	-2.7%

Table 15 summarizes total vehicle miles traveled (VMT) per day in 2035. The land use plan resulted in reducing VMT by 2.7% region-wide as compared to the Baseline Growth Forecast. Additionally, every county experiences VMT reductions with the largest benefits seen in Riverside and San Bernardino Counties, respectively.

TABLE 16 DAILY VEHICLE HOURS TRAVELED (VHT) IN 2035

County	(in Thousands) 2008 RTP Baseline Growth Forecast Alternative	2008 RTP Policy Growth Forecast Alternative	2008 RTP Plan Benefits	2008 RTP Plan Benefits Percentage
Imperial	268	249	-19	-7.1%
Los Angeles	10,193	9,613	-580	-5.7%
Orange	3,097	2,996	-101	-3.3%
Riverside	3,427	2,588	-839	-24.5%
San Bernardino	3,202	2,530	-672	-21.0%
Ventura	767	747	-20	-2.6%
SCAG	20,954	18,723	-2,231	-10.6%

Table 16 summarizes total vehicle hours traveled (VHT) per day in 2035. The land use plan resulted in reducing VHT by 10.6% region-wide as compared to the Baseline Growth Forecast. Additionally, every county experiences VHT reductions with the largest benefits seen in Riverside and San Bernardino Counties, respectively.

TABLE 17 DAILY CONGESTION DELAY (IN HOURS) IN 2035

County	(In Thousands) 2008 RTP Baseline Growth Forecast Alternative	2008 RTP Plan Forecast Alternative	2008 RTP Plan Benefits	2008 RTP Plan Benefits Percentage
Imperial	43	35	-8	-18.6%
Los Angeles	3,934	3,511	-423	-10.8%
Orange	1,126	1,028	-98	-8.7%
Riverside	1,607	907	-700	-43.6%
San Bernardino	1,180	659	-521	-44.2%
Ventura	249	235	-14	-5.6%
SCAG	8,139	6,375	-1,764	-21.7%

Table 17 summarizes total congestion delay in hours per day in 2035. The land use plan resulted in reducing delay by 21.7% region-wide as compared to the Baseline Growth Forecast. Additionally, every county experiences congestion delay reductions with the largest benefits seen in Riverside and San Bernardino Counties, respectively.

There are many other quality of life benefits associated with the Plan Alternative compared to the Baseline Alternative. Transportation and land use modeling reveal the following:

- Daily transit boardings increase by 124,207 (3.9%)
- Daily non-motorized (walking and bicycle) trips increase by 143,294 (1.5%)
- Daily fuel consumption decreases by 1.3 million gallons
- Percentage of housing units within ⅓ mile of a passenger rail station increases by 163,962 (26%)
- This analysis shows a direct relationship between the adopted land use strategies in the Plan Alternative and regional quality of life benefits. Promoting an urban form that allows residents to bicycle and walk to daily destinations, improves access to transit, creates more jobs near

houses and houses near jobs reduces the need to travel far distances by car. The transportation model bears this out. Moreover, these strategies will serve as a catalyst to preserve existing open space, protect valuable natural habitat, reduce energy and other resource consumption and improve regional air quality.

Implementation Program

The 2008 Plan Alternative addresses the mandates of transportation planning law through its integration of land use decisions and transportation investments. The previously discussed growth policies form the framework for implementation of the Plan Alternative to meet system improvement and performance objectives of the 2008 RTP. Transportation modeling analysis confirms that these policies, when implemented, will realize significant regional benefits in the form of reductions in vehicle miles traveled and improved air quality.

Adoption of the Plan Alternative does not incur any direct financial costs to local governments. However, there is a local government cost each time that a jurisdiction chooses to research, plan or implement new plans or policies, such as zoning ordinances, regulations, incentive programs, General Plans, Specific Plans or other planning strategies. These implementation actions are ultimately in the hands of local governments, as local land use decisions are outside of SCAG's purview. Nevertheless, SCAG offers implementation assistance to jurisdictions choosing to apply the policies outlined in the plan through a number of actions that will require collaboration at all levels of both public and private entities. Engaging cities, counties, subregions, county transportation commissions and other agencies through the following action steps is key to implementation.

1. Expand and develop the Compass Blueprint Program to continue its regional comprehensive planning efforts to help coordinate planning actions among local governments.
    a. Refine the regional vision, and identify additional strategies, policies and implementation tools to realize the Plan Alternative.
    b. Provide leadership and partnerships to local governments seeking to implement local planning policies and programs that are consistent with the Compass Blueprint growth scenario.
    c. Provide technical assistance and planning services to local and Subregional leaders and agencies involved in land use decision-making to implement local planning policies and programs that are consistent with the Compass Blueprint growth scenario.
    d. Continue outreach and education program that emphasizes partnerships and regional leadership, through a shared understanding of the benefits and implications of Compass Blueprint, and reinforces mutual interests among Southern Californians.
2. Continue to host a series of policy forums with regional stakeholders including:
    a. The Compass Blueprint Partnership, a group of elected officials, development professionals, policy experts and regional leaders to explore the directions, policies, tools and partnerships necessary for realizing the Plan Alternative.
    b. The Compass Blueprint Recognition Program, an ongoing awards program, recognizing plans and projects throughout the region that demonstrate innovative and forward-thinking planning efforts consistent with the Compass Growth Principles.
3. Utilize the State of the Region report to measure progress toward quantifiable goals derived from the Plan Alternative.
4. Support federal and state funding initiatives designed to promote mixed-use and multi-modal development wherein:
    a. Stakeholders leverage state infrastructure bond financing, including the Department of Housing and Community Development's Transit Oriented Development program and supporting legislation targeting infrastructure bond funds for regions with adopted growth visions

COMPASS BLUEPRINT IMPLEMENTATION STRATEGY

SCAG's Compass Blueprint Program has become a model for turning regional vision into local reality. Since 2004, SCAG has used innovative planning tools, creative strategies and dynamic partnerships to expand its Suite of Services and Demonstration Project consulting services that are available to all local governments in the region, free-of-charge.

As a voluntary program, SCAG provides these cutting-edge tools, analyses and comprehensive planning services to cities that seek additional technical expertise or strategic planning in order to implement a plan, ordinance or program consistent with the Compass Blueprint Principles.

Popular tools in the Compass Blueprint Suite of Services include photo-morph and 3D video "fly-through" visualizations, a sophisticated "Tipping Point" return-on-investment tool that simulates a developer's pro-forma for potential projects and the "Envision" GIS-based land use scenario-building tool.

Building upon the Suite of Services, Compass Blueprint Demonstration Projects combine public participation, design and financial analysis to produce local plans that respond to community interests and are market-feasible, i.e. plans that will be adopted and realized because of their benefits to all stakeholders. Demonstration Projects range from parcel-specific zoning analyses to county-wide plans around transit stations, and include an array of services including tipping point and business functionality analyses, design charrettes and community workshops, housing prototypes and conceptual land use plans, parking studies, and transit-oriented development strategies.

For example, planning around the Exposition Line light rail has helped the City of Los Angeles revamp a model TOD ordinance that, prior, had stimulated little TOD.

With an ever-growing portfolio of completed, documented Demonstration Projects, an expanding Suite of Services, and significant improvements to existing tools, implementation efforts have seen sustained improvement since the Growth Vision was adopted. SCAG recently launched "Toolbox Tuesdays," a series of training seminars for local planning staff through which they can learn the skills and software capabilities necessary to build their own in-house capacities for using the Compass Blueprint-developed tools.

This transferability is a cornerstone of the implementation strategy. Demonstration Projects are scoped to be just that - examples for others to emulate. The Compass Blueprint website and annual Awards Program event are other important vehicles for sharing lessons learned. Services have been sought through the Compass Blueprint program for over 50 sites in jurisdictions all over the region

Example of photo-realistic visualization tool

(such as the Compass Blueprint) and for projects consistent with these visions.

b. Subregional organizations leverage the federal transportation planning funds available at the Subregional level, to complete projects that integrate land use and transportation planning and implement Compass Blueprint principles.

5. Support legislation that provides incentives to public and private agencies that incorporate the Plan Alternative strategies into development projects.

STRATEGIC INITIATIVE

SCAG and County Transportation Commissions should initiate a program to secure significant resources for implementing Compass Blueprint. The program would provide infrastructure funding for specific allowable costs of development projects that integrate land use and transportation planning and are consistent with the Compass Blueprint Strategy.

MONITORING

SCAG shall develop an objective monitoring system to gather data and measure regional progress toward implementing the Compass Blueprint growth scenario and achieving the objectives of the Plan Alternative.

- Define a methodology for assessing local General Plans' consistency with Compass Blueprint.
- Develop a data set and methodology for determining what portion of regional growth is occurring within Strategic Opportunity Areas.

SCAG shall use its Intergovernmental Review process (IGR) role to provide robust review and comment on large development projects and their consistency with the Compass Blueprint.

Appendix A - Baseline Growth Forecast Methodology

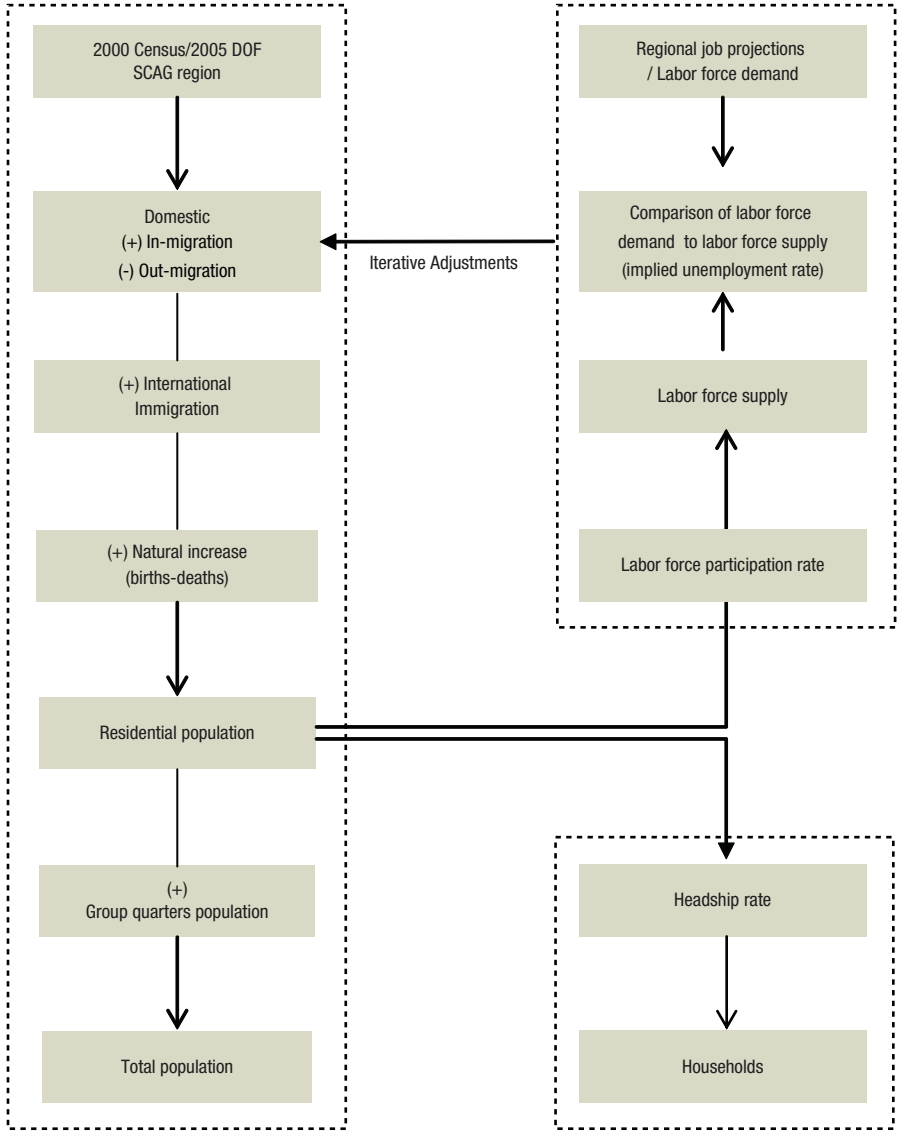
Appendix A describes the methodology and key assumptions for the SCAG regional baseline demographic and employment forecast at the region, county, and city level.

DEMOGRAPHIC FORECAST METHODOLOGY

REGIONAL POPULATION TREND PROJECTION

The regional population trend projection process shows the linkage of population, households, and employment (See figure A1). The three major variables are projected by reflecting the reasonable relationships among those variables. Demographic rates are used to link these major variables, including headship rate, labor force participation rate, implied unemployment rate, and domestic migration rate.

FIGURE A1 REGIONAL DEMOGRAPHIC FORECAST PROCESS



Cohort-Component Model

SCAG projects regional population using the cohort-component model. The model computes the population at a future point in time by adding to the existing population the number of group quarters population, births and persons moving into the region during a projection period, and by subtracting the number of deaths and the number of persons moving out of the area. This process is formalized in the demographic balancing equation. The following balancing equation is prepared using year t_0 and year t_1

$$POP_{t_1}^{region} = POP_{t_0}^{region} + Q_{t_0-t_1}^{region} + B_{t_0-t_1}^{region} - D_{t_0-t_1}^{region} + NETMIG_{t_0-t_1}^{region}$$

where

$POP_{t_1}^{region}$ = total population at the future year t_1

$POP_{t_0}^{region}$ = total population at the base year t_0

$Q_{t_0-t_1}^{region}$ = the number of group quarters population that occur during the interval t_0 - t_1

$B_{t_0-t_1}^{region}$ = the number of births that occur during the interval t_0 - t_1

$D_{t_0-t_1}^{region}$ = the number of deaths that occur during the interval t_0 - t_1

$NETMIG_{t_0-t_1}^{region}$ = the amount of net migration that occurs during the interval t_0 - t_1

The following is a description of how components of population change are projected. Two time periods: 2005 and 2010 are used as an example.

Group quarters population

$$Q_{t_{2010}}^{region} = RES_{t_{2010}}^{region} * CGQR_{t_{2000}}^{region}$$

where

$Q_{t_{2010}}^{region}$ = group quarters population in 2010.

$RES_{t_{2010}}^{region}$ = regional civilian resident population in 2010

$CGQR_{t_{2000}}^{region}$ = the ratio of group quarters population to total population from 2000 census

Births

$$B_{t_{2005-2010}}^{region} = BASEFEM_{t_{2005-2010}}^{region} * FERTR_{t_{2005-2010}}^{region}$$

where

$B_{t_{2000-2005}}^{region}$ = the number of births between 2005 and 2010

$BASEFEM_{t_{2005-2010}}^{region}$ = base female population would be civilian resident female population, reflecting female inmigrants, outmigrants, and immigrants, who belong to child bearing ages (10-49) for the period of 2005 and 2010

$FERTR_{t_{2005-2010}}^{region}$ = fertility rate between 2005 and 2010

Deaths (Survived Population)

$$D_{t_{2005-2010}}^{region} = BASEPOP_{t_{2005-2010}}^{region} * MORTALR_{t_{2005-2010}}^{region}$$

$$SURVR_{t_{2005-2010}}^{region} = 1 - MORTALR_{t_{2005-2010}}^{region}$$

$$S_{t_{2005-2010}}^{region} = BASEPOP_{t_{2005}}^{region} * SURVR_{t_{2005-2010}}^{region}$$

where

$D_{t_{2005-2010}}^{region}$ = deaths between 2005 and 2010

$MORTALR_{t_{2005-2010}}^{region}$ = life table mortality rate (qx) between 2005 and 2010

$SURVR_{t_{20005-2010}}^{region}$ = life table survival rate (1-qx) between 2005 and 2010

$S_{t_{2005-2010}}^{region}$ = survived population between 2005 and 2010

Net Migration

$$NETMIG^{region}_{t_{2005-2010}} = INMIG^{region}_{t_{2005-2010}} - OUTMIG^{region}_{t_{2005-2010}} + IMMIG^{region}_{t_{2005-2010}}$$

$$INMIG^{region}_{t_{2005-2010}} = BASEPOP^{N}_{t_{2005-2010}} * INMIGR^{region}_{t_{2005-2010}}$$

$$OUTMIG^{region}_{t_{2005-2010}} = BASEPOP^{region}_{t_{2005-2010}} * OUTMIGR^{region}_{t_{2005-2010}}$$

$$IMMIG^{region}_{t_{2005-2010}} = (IMMIG^{region}_{t_{1990-2005}})/3$$

where

$NETMIG^{region}_{t_{2005-2010}}$ = net migrants between 2005 and 2010

$INMIG^{region}_{t_{2005-2010}}$ = domestic inmigrants from other areas in the nation to the region between 2005 and 2010

$OUTMIG^{region}_{t_{2005-2010}}$ = domestic outmigrants from the region to other areas in the nation between 2005 and 2010

$IMMIG^{region}_{t_{2005-2010}}$ = international net immigrants (including legal and undocumented) to the region between 2005 and 2010

$INMIGR^{region}_{t_{2005-2010}}$ = domestic inmigration rates measured in the ratio of domestic inmigrants between 2005 and 2010 to total US population in 2005

$OUTMIGR^{region}_{t_{2005-2010}}$ = domestic outmigration rates measured in the ratio of domestic outmigrants between 2005 and 2010 to total regional population in 2005

$IMMIG^{region}_{t_{1990-2005}}$ = international net immigrants (including legal and undocumented) to the region between 1990 and 2005

The fertility, mortality and migration rates are projected in five year intervals for eighteen age groups, for four mutually exclusive ethnic groups: Non-Hispanic White, Non-Hispanic Black, Non-Hispanic Asian/Others, and Hispanics. These demographic rates are also projected by population classes: residents (no-migrants), domestic migrants and international migrants.

Balance of Labor Force Demand and Labor Force Supply

SCAG links population dynamics to economic trends, and is based on the assumption that patterns of migration into and out of the region are influenced by the availability of jobs.

The future labor force supply is computed from the population projection model by multiplying civilian resident population by projected labor force participation rates. It is formulated in a following way.

$$LFS^{region}_{t_{2010}} = RES^{region}_{t_{2010}} * LFPR^{region}_{t_{2010}}$$

where

$LFS^{region}_{t_{2010}}$ = regional labor force supply in 2010

$RES^{region}_{t_{2010}}$ = regional civilian resident population in 2010

$LFPR^{region}_{t_{2010}}$ = regional labor force participation rate in 2010

This labor force supply is compared to the labor force demand based on the number of jobs projected using the shift-share economic model. The labor force demand is derived using two step processes. The first step is to convert jobs into workers using the double job rate, which is measured by the proportion of workers holding two jobs or more to total workers.

$$WRKR^{region}_{t_{2010}} = JOB^{region}_{t_{2010}} (1 + DJR^{region}_{t_{2010}})$$

where

$WRKR^{region}_{t_{2010}}$ = regional workers in 2010

$JOB^{region}_{t_{2010}}$ = regional jobs in 2010

$DJR^{region}_{t_{2010}} = (JOB^{region}_{t_{2005}} / WRKR^{region}_{t_{2005}}) - 1$ = regional double job rate in 2010

The second step is to convert workers into labor force demand using the regional unemployment rate.

$$LFD_{t_{2010}}^{region} = WRKR_{t_{2010}}^{region} \left(1 - UNEMP_{t_{2010}}^{region}\right)$$

where

$LFD_{t_{2010}}^{region}$ = regional labor force demand in 2010

$WRKR_{t_{2010}}^{region}$ = regional workers in 2010

$UNEMP_{t_{2010}}^{region}$ = regional unemployment rate in 2010

If any imbalance occurs between labor force demand and labor force supply, it is corrected by adjusting the domestic migration assumptions of the demographic projection model. The gross migration optimization technique produces reasonable gross in-migration and out-migration assumptions by optimizing traditional adjustment factors used in the plus-minus method. The major advantage of the gross migration optimization technique is to immediately develop the size of in-migration and out-migration, while maintaining acceptable age and sex specific in-migration and out-migration schedules. Adjusted migration assumptions are followed by total population changes.

Key Regional Demographic Assumptions

Key demographic estimates and projections are updated since 2004 RTP growth forecast, California Department of Finance have updated estimates of population and households. US Census Bureau released interim projections of the U.S. and California State population by age, sex, race, and Hispanic origin in March-April 2004. California Department of Finance released population projections by race/ethnicity for California and its Counties 2000–2050 in May 2004.

Analysis of the recent trends of regional population and households from diverse statistical sources indicates that the fertility rate declines, the mortality rate declines, net immigration levels off, net domestic migration fluctuates with the economic cycle, the labor force participation rate decline, and the household headship rate declines. With additional regional assumptions of the constant double job rate (4.5%) and the implied regional unemployment rate (5%-7%), SCAG developed the demographic assumptions for the regional population and household projection.

Fertility

The total fertility rate is defined as the average number of children that would be born to a woman over her lifetime if she were to experience the exact current age-specific fertility rates (ASFRs) through her lifetime. It is obtained by summing the age-specific rates for a given time-point. Four race/ethnic female groups in Southern California show a lower fertility rate than that of US average of the specific race/ethnic group. SCAG keeps 2000-2005 total fertility rates of NH White, NH Asian & Others, and Hispanic female groups constant to 2035. The Hispanic fertility rate is assumed to decline during the projection period following the projected fertility rate changes of U.S. projected middle series and interim projections

TABLE A1 TOTAL FERTILITY BY RACE/ETHNICITY, 2000-2005 AND 2030-2035

Race/Ethnicity	2000-2005	2030-2035
NH White	1.6	1.6
NH Black	1.7	1.7
NH Asian & Others	1.4 (2.0*)	1.4 (2.0*)
Hispanic	2.5 (2.8*)	2.3 (2.5*)
Total	2.1	2.0

Note: female domestic migrants are based on the fertility rate assumption of base population (female no-migrants during the projection period). The female immigrants tend to have a higher fertility rate that that of the female no-migrants of the specific race/ethnic groups. NH Asian & Others, and Hispanic female show a higher fertility rate than no-migrants, while NH White and NH Black female groups do not show a difference between no-migrants and immigrants.

Mortality

Life expectancy at birth improves at the same rate as that of the national life expectancy at birth improves as assumed by the US Census Bureau Middle-Series Projection and interim projections during the projection horizon. Population generally increases the life expectancy at birth by 6%-7% from 2000 to 2035.

TABLE A2 LIFE EXPECTANCY AT BIRTH BY SEX, 2000 AND 2035

Sex	2000	2035
Male	74.8	79.7
Female	80.5	85.4

Migration

International net immigration is determined using the annual average (125,000) of international net immigration (1990-2005), including documented and undocumented immigrants. Domestic migration is influenced by labor demand, derived from regional employment forecasts. Race/ethnic distribution of domestic in-migrants and domestic out-migrants is determined by reflecting the changing share of the base race/ethnic population during the projection horizon. For example, the Hispanic population increases its share of domestic in- and out-migration during the projection horizon because of its increasing share of population in the region. The race/ethnic distribution of net immigration is derived using the average of 2000 Census estimates and 2005 Pew Hispanic Center Estimate, and is assumed to remain constant during the projection horizon. Age-sex composition of domestic and international migrants is based on the 2000 Census.

TABLE A3 RACE/ETHNIC DISTRIBUTION OF NET IMMIGRATION, 2000-2005 AND 2030-2035

Race/Ethnicity	2000-2005	2030-2035
NH White	11%	11%
NH Black	3%	3%
NH Asian & Others	19%	19%
Hispanic	68%	68%
Total	100%	100%

TABLE A4 RACE/ETHNIC DISTRIBUTION OF DOMESTIC IN-MIGRATION, 1995-2000 AND 2030-2035

Race/Ethnicity	1995-2000	2030-2035
NH White	55%	33%
NH Black	8%	8%
NH Asian & Others	16%	22%
Hispanic	21%	38%
Total	100%	100%

TABLE A5 RACE/ETHNIC DISTRIBUTION OF DOMESTIC OUT-MIGRATION, 1995-2000 AND 2030-2035

Race/Ethnicity	1995-2000	2030-2035
NH White	48%	35%
NH Black	7%	7%
NH Asian & Others	13%	16%
Hispanic	31%	43%
Total	100%	100%

Labor Force Participation

The 2035 labor force participation rate by age, sex, and race/ethnicity is determined by trending 2005 SCAG labor force participation rate with U.S BLS projected national labor force participation rate between 2005 and 2035. SCAG assumed that Black/Asian/Hispanic female labor force participation rate would converge towards the White female labor force participation rate. SCAG also assumed that the elderly population of 55 years old or more would show higher labor force participation rate over time due to lack of the skilled labor force associated with the retirement of baby boomers.

TABLE A6 LABOR FORCE PARTICIPATION RATE BY RACE/ETHNICITY, 2005 AND 2035

Race/Ethnicity	2005	2035
NH White	64%	58%
NH Black	59%	56%
NH Asian & Others	62%	58%
Hispanic	61%	58%
Total	62%	58%

REGIONAL HOUSEHOLD TREND PROJECTION

Regional Household Projection Model

SCAG develops the estimates of 2005 total households by age, sex, and race/ethnicity using the 2000 Census and California Department of Finance Estimates of total households for January 1, 2005 and January 1, 2006.

SCAG projects regional households by using projected headship rate. The projected households at a future point in time are computed by multiplying the projected civilian resident population by projected headship rates. The following illustration describes how 2010 households are projected.

$$HHLD_{t_{2010}}^{region} = RES_{t_{2010}}^{region} * HEADR_{t_{2010}}^{region}$$

where

$HHLD_{t_{2010}}^{region}$ = regional households by age, sex, and ethnicity in 2010

$RES_{t_{2010}}^{region}$ = regional civilian resident population by age, sex, and race/ethnicity in 2010

$HEADR_{t_{2010}}^{region}$ = regional headship rates by age, sex, and race/ethnicity in 2010

Headship rate is the proportion of a population cohort that forms the household. It is specified by age, sex, and race/ethnicity. Headship rate is projected in 5 year intervals for each sex (male and female), seven age groups (for instance, 15-24, 25-34, 35-44, 45-54, 55-64, 65-74, 75+), and four mutually exclusive ethnic groups.

Regional Headship Rate Assumptions

The SCAG regional household headship rates have declined from 46.7% in 1980, to 43.7% in 1990, to 43.1% in 2000, to 41.4% in 2005. The overall household headship rate in 2035 is expected to be 41%, slightly lower than that of 2005. The overall male household headship rate is assumed to decrease during the projection horizon, while the overall female household headship rate is assumed to increase. Asian and Others' household headship rate is assumed to converge towards the White household headship rate by 50 percent of the difference from the 2000 Census White headship rate. Hispanic household headship rate is assumed to converge towards the White household headship rate by 25 percent of the difference from the 2000 Census White headship rate.

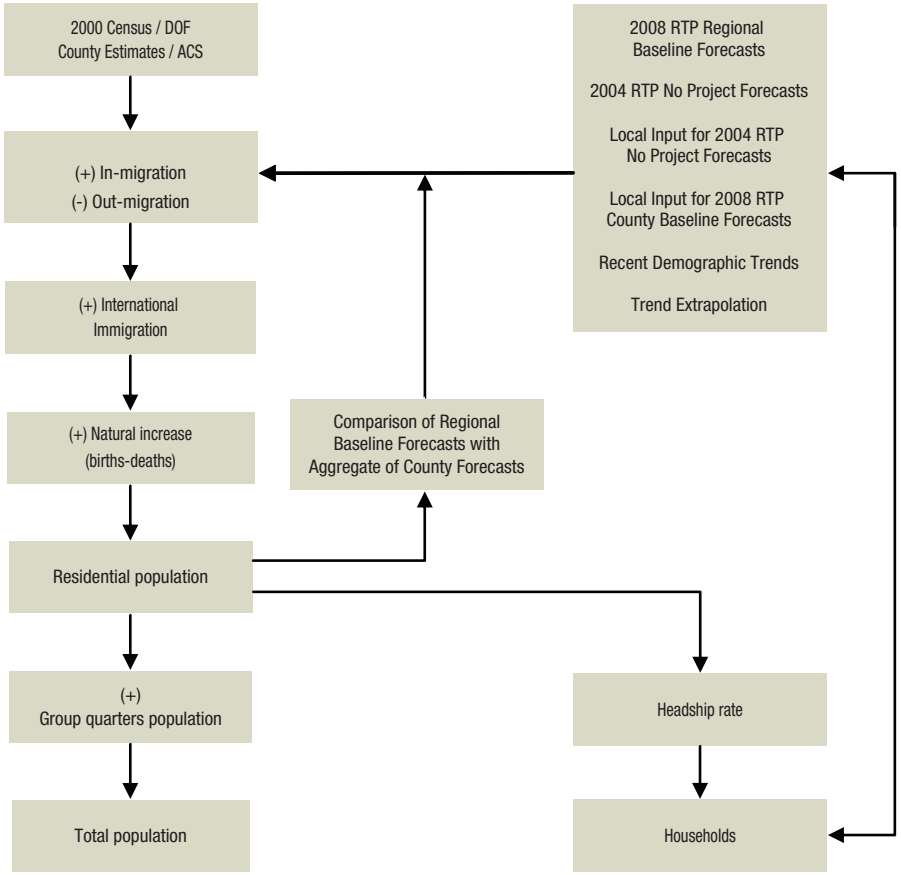
TABLE A7 HOUSEHOLD HEADSHIP RATE BY RACE/ETHNICITY, 2005 AND 2035

Race/Ethnicity	2005	2035
NH White	49%	49%
NH Black	47%	49%
NH Asian & Others	38%	41%
Hispanic	34%	36%
Total	41.4%	41.0%

County Population and Household Trend Projection

As used in the regional population and household projection, SCAG uses the cohort-component model and the headship rate to project the county population and households. The sum of county projections is compared to the regional independent projections. If results are significantly divergent, input data at the county level is adjusted to bring the sum of counties projection and the regional independent projections more closely in line. Complete agreement between two projections is not mandatory. After analysis, the sum of counties constitutes the regional baseline projections.

FIGURE A2 COUNTY DEMOGRAPHIC FORECAST PROCESS



County Demographic Assumptions

Fertility and Mortality

If county birth rates by age and race/ethnicity are higher than the regional birth rates by age and race/ethnicity, then the county birth rates are converged towards regional birth rates by 100 percent in 2035. If county birth rates by age and race/ethnicity are lower than the regional birth rates by age and race/ethnicity, then keep the county birth rates constant during the projection horizon. The regional survival rate by age, sex, and race/ethnicity is uniformly applied to all counties in the region.

Migration

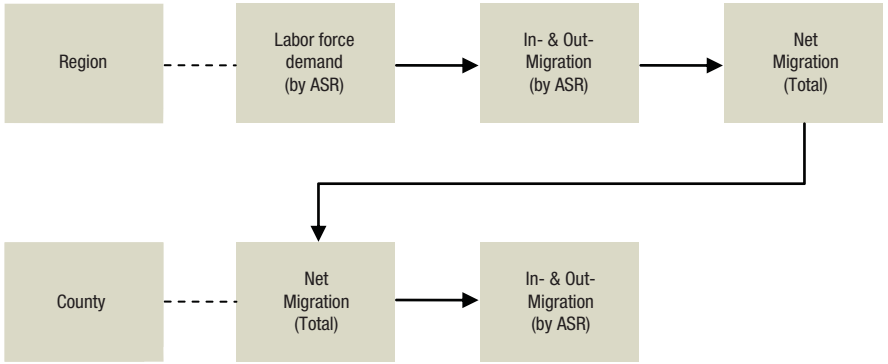
International net immigration is determined using the annual average of international net immigration (1990-2005), including documented and undocumented immigrants. Domestic net migration, in particular, the county share of the regional domestic net migration, is determined by the historical trend of domestic net migration, projected regional domestic net migration, and sub-regional input. The race/ethnic distribution of domestic in- and out-migrants is developed by trending county distribution to projected race/ethnic change in the regional distribution. The race/ethnic distribution of net immigration is derived using the average of 2000 Census estimates and 2005 Pew Hispanic Center Estimate, and is assumed to remain constant during the projection horizon. Age-sex composition of domestic and international migrants is based on the 2000 Census.

The county migration model follows some regional modeling approach: 1) cohort component approach (birth, death, and net migration) and 2) two region gross migration model, but it emphasizes 1) the county allocation algorithm of net international and domestic migration instead of structural model, 2) the top-down approach. Net international and domestic migration by county is initially derived by allocating the regional net migration into counties using the historical trends (with different base periods). The derived net domestic migration is further disaggregated into in- and out-migration. The linkage of regional and county level migration projection modules are shown below (See figure 3)

Headship rate

The county headship rate by age, sex, and race/ethnicity is developed by trending county headship rate in the base year to projected rate change in the regional model.

FIGURE A3 LINKAGE OF REGION AND COUNTY MIGRATION MODULES



Note: ASR = age, sex, and race/ethnicity

CITY POPULATION AND HOUSEHOLD TREND PROJECTION

City Demographic Projection Model

The city level demographic trend projections are based on the housing unit method, which is one of the most widely used methods, to project local area households and population for planning purposes. The housing unit method consists of the following three projections of: households, average household size, and group quarters population. Each of three components is projected into the future. The projected population in year t1 is expressed as

$$POP_{t_1}^{city} = (HHLD_{t_1}^{city} * PPH_{t_1}^{city}) + Q_{t_1}^{ciity}$$

where

$POP_{t_1}^{city}$ = total population at the future year t_1

$HHLD_{t_1}^{city}$ = total households at the future year t_1

$PPH_{t_1}^{city}$ = the average persons per household at the future year t_1

$Q_{t_1}^{ciity}$ = the group quarters population at the future year t_1

The housing unit method is implemented in the following way. First, households (occupied housing units) are projected by extrapolating the past trend of occupied housing units. The methodology for developing the occupied housing projection is a constrained extrapolation using stochastic simulation. It is found that the exponential provides the best fit to the historical data and provides the most plausible projection year values. Experimentation with the simulation also indicates that 10,000 simulated values produce stable projection estimates. The input data series can include up to 21 observations by combining information from the California Department of Finance E-5 series with enumeration-based values from the 1980, 1990, and 2000 censuses. The model parameters are estimated using the 21 observation series for each city.

Second, household (residential) population is estimated by multiplying occupied housing units (households) by the projected average household size. The average household size projection is problematic given the tension between expectations for a strong demographic component in the methodology and the lack of suitable data to support such a methodology. The so called 'state-of-the-art' for average household size projections tends to be very rudimentary at the city level.

Third, projected group quarters population is added to projected household population. The group quarters population is projected based on 2000 ratio of group quarters population to total population.

The preliminary projections of three components of the housing unit method are adjusted to control to the county projections. The housing unit method described above was originally applied to develop 2004 RTP city population and household trend projection. Once the city demographic trend projection is derived, diverse public outreach including local and subregional review and subregional workshops are used to reflect the reasonable assumptions and acceptable trends.

City Demographic Assumptions

The trend extrapolations of households do consider anything beyond historical trends in the data. Institutional constraints, land constraints, and build-

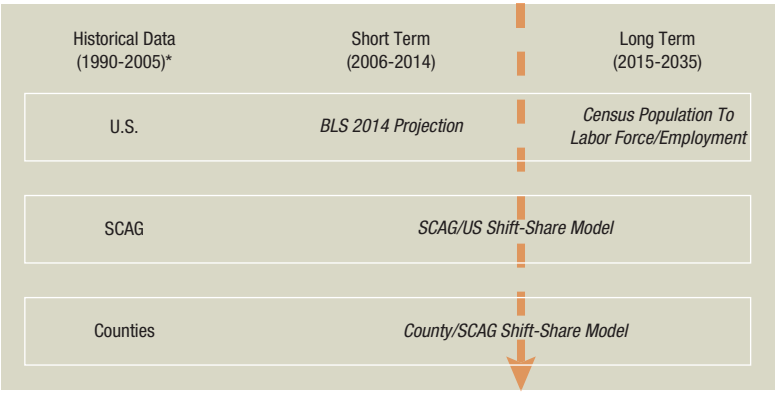
out scenarios from general plans are not considered in the trend projection. The development constraints, however, are eventually reflected in the process of developing the small area forecast. Average household size values are assumed to range from 1.2 to 5.5. These bounds of household size values are determined by expert opinion.

EMPLOYMENT FORECAST METHODOLOGY

The SCAG regional employment growth forecast is developed using a top down procedure from the national population and employment forecast to the region, county, and city level employment forecast.

REGIONAL EMPLOYMENT TREND PROJECTION

FIGURE A4 EMPLOYMENT FORECAST FRAMEWORK



Shift-Share Model

SCAG projects regional employment using the shift-share model. The shift-share model is widely used because they are conceptually and computationally straightforward, require only easily accessible data, and provide fast and reasonably accurate projections, given their costs. The model computes the employment at a future point in time by using a regional share of the nation's employment.

$$EMP_{t_1}^{region} = EMP_{t_0}^{region} + (EMP_{t_0-t_1}^{nation} * SHARE_{t_a-t_b}^{region})$$

$$SHARE_{t_a-t_b}^{region} = EMP_{t_a-t_b}^{region} / EMP_{t_a-t_b}^{nation}$$

where

$EMP_{t_1}^{region}$ = regional employment at the future year t_1

$EMP_{t_0}^{region}$ = regional employment at the base year t_0

$EMP_{t_1}^{nation}$ = national employment at the future year t_1

$SHARE_{t_a-t_b}^{region}$ = a regional share of the nation's employment during the interval $t_a - t_b$

National Employment Projection Model

The national employment projection is used as an input to calculate the regional employment with the assumption of the regional share of the national employment. The US Bureau of Labor Statistics (BLS) releases the short term national employment projection in November 2005. The most recent national employment projections cover 2004-2014. SCAG develops its own long term national employment projection 2005-2035 by using the most recent US BLS employment projections, US Census population projections, and key socioeconomic assumptions including labor force participation rates, unemployment rates, and the ratio of jobs to worker.

The national employment projection is derived using the following procedure.

$$JOB_{t_1}^{nation} = POP_{t_1}^{nation} * LFPR_{t_1}^{nation} * (1 - UNEMP_{t_1}^{nation}) * (1 + DJR_{t_1}^{nation})$$

where

$JOB_{t_1}^{nation}$ = national employment at the future year t_1

$POP_{t_1}^{nation}$ = national population at the future year t_1

$LFPR_{t_1}^{nation}$ = national labor force at the future year t_1

$UNEMP_{t_1}^{nation}$ = national unemployment rate at the future year t_1

$DJR_{t_1}^{nation} = (JOB_{t_0}^{nation} / WRKR_{t_0}^{nation} - 1)$ = the national double job rate at the future year t_1

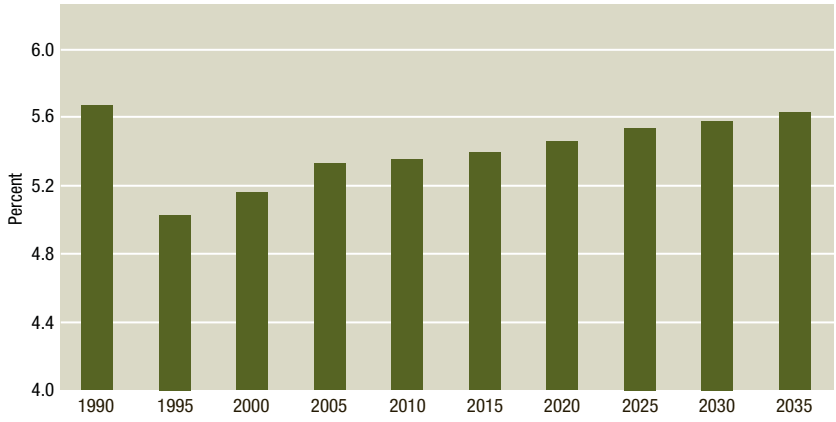
Key Regional Model Assumptions

Since 2004 RTP growth forecast, US Census Bureau released interim projections of the U.S. population by age, sex, race, and Hispanic origin in March 2004. US BLS updated labor force participation rate projection. SCAG developed the following key national socioeconomic assumptions for the national employment projection: the implied unemployment rate, the double job rate and the labor force participation rate. The implied unemployment rate is determined at 5.2% using the ten year average of 1995 and 2005. The unemployment rate remains constant during the projection horizon. The double job rate is set at 5.3% using the 2006 BLS estimate. SCAG adjusted the US BLS labor force participation rate of older age cohorts (55+) upward to reflect the behavioral change of those older age cohorts associated with the retirement of baby boomers and lack of skilled labor force.

Regional Share of National Employment

The regional share of national employment is developed by extrapolating the historical pattern of the regional share. Since there was an economic recession in the early 1990s, the regional share of national employment decreased from 5.7% in 1990 to 5.0% in 1995. After 1995, the region continues to increase its share of national employment. The most recent regional share of national employment was around 5.3% in 2005. SCAG expects that the regional share increases from 5.3% in 2005 to 5.5% in 2014, and maintains its share (5.5%) between 2014 and 2035.

FIGURE A5 THE REGIONAL SHARE OF NATIONAL EMPLOYMENT, 1990-2035



Regional Industry Projection Model

SCAG projects regional employment of industry sectors using the shift-share model. Employment projection is made for 20 major industry sectors classified by North American Industry Classification System (NAICS). The industry sectors include 1) Total Farm, 2) Natural Resources and Mining, 3) Utilities, 4) Construction, 5) Manufacturing, 6) Wholesale Trade, 7) Retail Trade, 8) Transportation and Warehousing, 9) Information, 10) Finance and Insurance, 11) Real Estate and Rental and Leasing, 12) Professional, Scientific and Technical Services, 13) Management of Companies and Enterprises, 14) Administrative and Support and Waste Services, 15) Educational Services, 16) Health Care and Social Assistance, 17) Arts, Entertainment, and Recreation, 18) Accommodation and Food Service, 19) Other Services, 20) Public Administration. The model computes the employment in industry sector i at a future point in time by using a regional share of the nation's employment in industry sector i.

$$EMP_{t_1}^{region_i} = EMP_{t_0}^{region_i} + (EMP_{t_0-t_1}^{nation_i} * SHARE_{t_a-t_b}^{region_i})$$

$$SHARE_{t_a-t_b}^{region_i} = EMP_{t_a-t_b}^{region_i} / EMP_{t_a-t_b}^{nation_i}$$

where

$EMP_{t_1}^{region_i}$ = regional employment in industry sector i at the future year t_1

$EMP_{t_0}^{region_i}$ = regional employment in industry sector i at the base year t_0

$SHARE_{t_a-t_b}^{region_i}$ = a regional share of the nation's employment in industry sector i during the interval $t_a - t_b$

Once SCAG develops the regional employment, SCAG further develops the regional industry projection using six different "share" methods of projecting the share of each industry sector of total regional employment: 1) change in share of growth, 2) constant share of growth delta, 3) average share, 4) constant share of regional employment in 2005, 5) population growth, and 6) simple regression. The best method is selected among six methods through the statistical test. This approach is applied to the period of 2005-2014. The 2014 constant share approach is used to develop the share of each industry sector between 2014 and 2035.

The following is a brief discussion of the first five methods of calculating the regional share of national employment by industry sector using year 2014 as a projection year.

CHANGE IN SHARE OF GROWTH

The regional employment projection is based on the assumption that the industry sectors' share of the regional employment will increase its share by 50 percent of the annual average share of change from the period of 1994 and 2005 (or 1990-2005) for the target year 2014.

Two different base periods are used to compute the industry sectors' share of the regional employment. This method is applied to the following industry sectors: 1) Total Farm (1994-2005), 2) Utilities (1990-2005), 3) Wholesale Trade (1994-2005), 4) Finance and Insurance (1990-2005), 5) Arts, Entertainment, and Recreation (1994-2005), and 6) Accommodation and Food Service (1994-2005). The regional employment projection in selected industry sector i for year 2014 using the base periods of 1994 and 2005 is calculated as follows:

$$EMP_{t_{2014}}^{region_i} = EMP_{t_{2014}}^{region} * A(SHARE_{t_{1994}-t_{2005}}^{region_i})$$

$$SHARE_{t_{1994}-t_{2005}}^{region_i} = EMP_{t_{1994}-t_{2005}}^{region_i} / EMP_{t_{1994}-t_{2005}}^{region}$$

where

$EMP_{t_{2014}}^{region_i}$ = regional employment in industry sector i in 2014

$EMP_{t_{2014}}^{region}$ = regional employment in 2014

A= change in share

$SHARE_{t_{1994}-t_{2005}}^{region_i}$ = a regional share of the nation's employment in industry sector i during the interval $t_{1994} - t_{2005}$.

CONSTANT SHARE OF GROWTH DELTA

The regional employment projection is based on the assumption that the regional employment growth in industry sectors will maintain a constant share of the national employment growth in industry sectors. Two different growth periods (1994-2005 and 1990-2005) are used as a base period. This method is applied to the following industry sectors: 1) Manufacturing (1990-2005), 2) Transportation and Warehousing (1994-2005), 3) Information (1990-2005), and 4) Professional, Scientific and Technical Services (1994-2005). The regional employment projection in selected industry sector i for year 2014 using the base periods of 1994 and 2005 is calculated as follows:

$$EMP_{t_{2014}}^{region_i} = EMP_{t_{2014}}^{nation_i} * SHARE_{t_{1994}-t_{2005}}^{region_i}$$

$$SHARE_{t_{1994}-t_{2005}}^{region_i} = EMP_{t_{1994}-t_{2005}}^{region_i} / EMP_{t_{1994}-t_{2005}}^{nation_i}$$

where

$EMP^{region_i}_{t_{2014}}$ = regional employment in industry sector i in 2014

$EMP^{nation_i}_{t_{2014}}$ = national employment in industry sector i in 2014

$SHARE^{region_i}_{t_{1994}-t_{2005}}$ = a regional share of the nation's employment in industry sector i during the interval $t_{1994} - t_{2005}$.

$EMP^{region_i}_{t_{1995-2005}}$ = growth of regional employment in industry sector i between 1994 and 2005

$EMP^{nation_i}_{t_{1995-2005}}$ = growth of national employment in industry sector i between 1994 and 2005

Average Share

The regional employment projection is based on the annual average share of the regional employment in industry sectors between 1995 and 2005. The historical average share methodology is normally used when the industry job share has been relatively constant, the change in share method is not suitable and it is reasonable to assume that the regional share will not change. It is normally assumed that the historical average share will continue because there is rarely specific information to the contrary. This method is applied to Natural Resources and Mining.

Constant Share of Regional Employment in 2005

The regional employment projection is based on the assumption that the 2005 regional employment in industry sectors will maintain a constant share of 2005 total regional employment. This method is applied to the following industry sectors: 1) Real Estate and Rental and Leasing 2) Management of Companies and Enterprises, and 3) Administrative and Support and Waste Services. The regional employment projection in industry sector i for year 2014 is computed as follows:

$$EMP^{region_i}_{t_{2014}} = EMP^{region}_{t_{2014}} * SHARE^{region_i}_{t_{2005}}$$

$$SHARE^{region_i}_{t_{2005}} = EMP^{region_i}_{t_{2005}} / EMP^{region}_{t_{2005}}$$

where

$EMP^{region_i}_{t_{2014}}$ = regional employment in industry sector i in 2104

$EMP^{region}_{t_{2014}}$ = total regional employment in 2010

$SHARE^{region}_{t_{2005}}$ = a regional share of the nation's employment in industry sectors indicated above in 2005

$EMP^{region_i}_{t_{2005}}$ = regional employment in industry sector i in 2005

$EMP^{region}_{t_{2005}}$ = total regional employment in 2005

Population Growth

The regional employment projection in some industry sectors is related to population growth. The projection of non-basic (population servicing) industries is based on population growth. One growth period (1994-2005) is used as a base period. This method is applied to the following industry sectors: 1) Construction, 2) Educational Services, 3) Health Care and Social Assistance, 4) Other Services, and 5) Public Administration. The regional employment projection in a selected industry sector i for year 2014 using the base period of 1994 and 2005 is calculated as follows:

$$EMP^{region_i}_{t_{2014}} = EMP^{region_i}_{t_{2005}} + POP^{region}_{t_{2005-2014}} * (SHARE^{region_i}_{t_{1994}-t_{2005}})$$

$$SHARE^{region_i}_{t_{1994}-t_{2005}} = EMP^{region_i}_{t_{1994}-t_{2005}} / POP^{region}_{t_{1994}-t_{2005}}$$

where

$EMP^{region_i}_{t_{2014}}$ = regional employment in industry sector i in 2014

$EMP^{region_i}_{t_{2005}}$ = regional employment in industry sector i in 2005

$POP^{region}_{t_{2005-2014}}$ = regional population growth between 2005 and 2014

$EMP^{region_i}_{t_{1994-2005}}$ = regional employment in industry sector i between 1994 and 2005

$POP^{region}_{t_{1994-2005}}$ = regional population growth between 1994 and 2005

Base Year Employment Estimates

SCAG total employment for the base year (2003) is estimated based on a) Wage & Salary employment from California Employment Development Department (EDD), and b) Self-employment estimates. Total employment is estimated by each of 20 industries based on NAICS.

CA EDD revises wage & salary employment estimates according to detailed tax records. Tax record data are used through March of previous year; therefore, the revision is referred to as the March Benchmark. On March 4, 2005, CA EDD released March 2004 Benchmark data

Self-employment is calculated using the self-employment rate and wage & salary employment data. Self-employment rate is the share of self-employment to total employment. SCAG region self-employment rate is estimated at 8.3%, which derived from the 2000 US PUMS data.

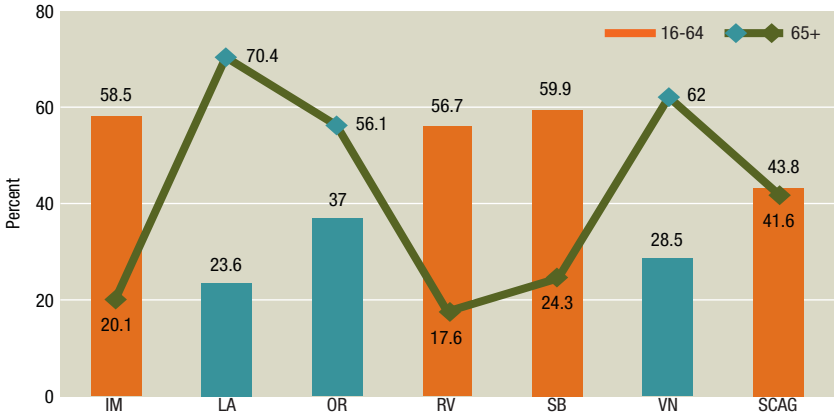
County Employment Trend Projection

As used in the regional employment projection, SCAG uses the shift-share model to project the county employment. The county industry projection also uses six different methods of projecting the share of each industry sector of total county employment: 1) change in share of growth, 2) constant share of growth delta, 3) average share, 4) constant share of regional employment in 2005, 5) population growth, and 6) simple regression. The best method is selected among the six methods through the statistical test.

SCAG incorporates the aging trend in developing the county employment forecast. Due to significant aging trends, the future growth of the working-age population (16-64) will be lower than that of the older population for Los Angeles, Orange, and Ventura, which will directly affect the growth of the labor force for those counties. For the Inland Empire and Imperial County, the growth of working-age population will be larger than the elderly population.

Figure 6 shows a projected age composition of population growth between 2000 and 2035. For example, Los Angeles, Orange, and Ventura counties show a relatively higher share of the elderly people, while Imperial, Riverside, and San Bernardino counties shows lower share of the elderly people during the same period.

FIGURE A6 AGE COMPOSITION OF POPULATION GROWTH BETWEEN 2000 AND 2035



As those impacts on national job growth, different level of aging trends at SCAG counties will affect the relative growth of working age population, which will in turn affect the relative "competitiveness" of each county in competing for the regional job growth.

SCAG staff tested the relationship between job growth and labor force growth, and found that slower growth in working age population do statistically result in slower job growth. Thus employment growth and shares of regional jobs in Los Angeles, Orange, and Ventura Counties are projected to slowdown further, more than the historical trends. On the other hand, jobs in Imperial

and the Inland Empire are projected to grow faster than growth suggested by historical trends.

CITY EMPLOYMENT TREND PROJECTION

SCAG traditionally estimated the city level employment by industry sector using private and public sources including Dun & Bradstreet, InfoUSA, and California EDD. For the 2008 RTP, SCAG planned to use ES202 (or the Quarterly Census of Employment and Wages (QCEW)) for city level employment estimates. ES202 data include wage and salaried employees based on quarterly tax reports submitted to CA EDD by California employers. ES202 data, electronically delivered to SCAG staff by CA EDD staff, did not match the CA EDD County employment estimate. There was a difference in 1 million jobs between ES 2020 and EDD benchmark database.

SCAG used US Census Transportation Planning Package (CTPP) 2000 for the city level employment estimates and projection. CTPP is intended to survey transportation planning activities of workers. CTPP part 2 provides information of workers by place of work at both city and block group levels. CTPP is based on large sample (1 in 6 households). There might be an undercount issue. Between 1990 and 2000, SCAG region employment increased by 7%, while CTPP data showed 1% reduction. Employment distribution has an implication for trip attractiveness, truck model, and housing. CTPP was used as a basis to distribute employment to cities. For long term purpose, staff will continue to evaluate ES202 data

The city level employment projection is based on the constant share method. The industry sectors of each city within a county are assumed to maintain the 2000 constant share of the county employment in the specific industries.

$$EMP_{t_{2014}}^{city_i} = EMP_{t_{2014}}^{county_i} * SHARE_{t_{2000}}^{cty}$$

$$SHARE_{t_{2000}}^{city_i} = EMP_{t_{2000}}^{city_i} / EMP_{t_{2000}}^{county_i}$$

where

$EMP_{t_{2014}}^{city_i}$ = city employment in industry sector i in 2014

$EMP_{t_{2014}}^{county_i}$ = county regional employment in industry sector i in 2014

$SHARE_{t_{2000}}^{city_i}$ = a city's share of the county's employment in industry sectors in 2000

$EMP_{t_{2000}}^{city_i}$ = city employment in industry sector i in 2000

$EMP_{t_{2000}}^{county}$ = county employment in industry sector i in 2000

Appendix B - 2008 RTP/EIR Draft Growth Alternatives/Scenarios

Population, Households, and Employment in 2035

POPULATION IN 2035

County	Draft Baseline	RTP04 Update	Workshop	Envision	Draft Policy
Imperial	320,000	292,000	342,000	314,000	314,000
Los Angeles	12,338,000	12,232,000	12,057,000	12,588,000	12,588,000
Orange	3,654,000	3,771,000	3,750,000	3,775,000	3,699,000
Riverside	3,597,000	3,582,000	3,782,000	3,382,000	3,472,000
San Bernardino	3,134,000	3,131,000	3,095,000	2,957,000	2,957,000
Ventura	1,014,000	1,048,000	1,030,000	1,040,000	1,025,000
SCAG Region	24,056,000	24,056,000	24,056,000	24,056,000	24,056,000

HOUSEHOLDS IN 2035

County	Draft Baseline	RTP04 Update	Workshop	Envision	Draft Policy
Imperial	103,000	94,000	110,000	101,000	101,000
Los Angeles	4,003,000	3,970,000	3,912,000	4,087,000	4,087,000
Orange	1,118,000	1,155,000	1,148,000	1,159,000	1,134,000
Riverside	1,183,000	1,179,000	1,244,000	1,112,000	1,142,000
San Bernardino	973,000	972,000	961,000	914,000	914,000
Ventura	330,000	341,000	336,000	339,000	334,000
SCAG Region	7,710,000	7,710,000	7,710,000	7,710,000	7,710,000

EMPLOYMENT IN 2035

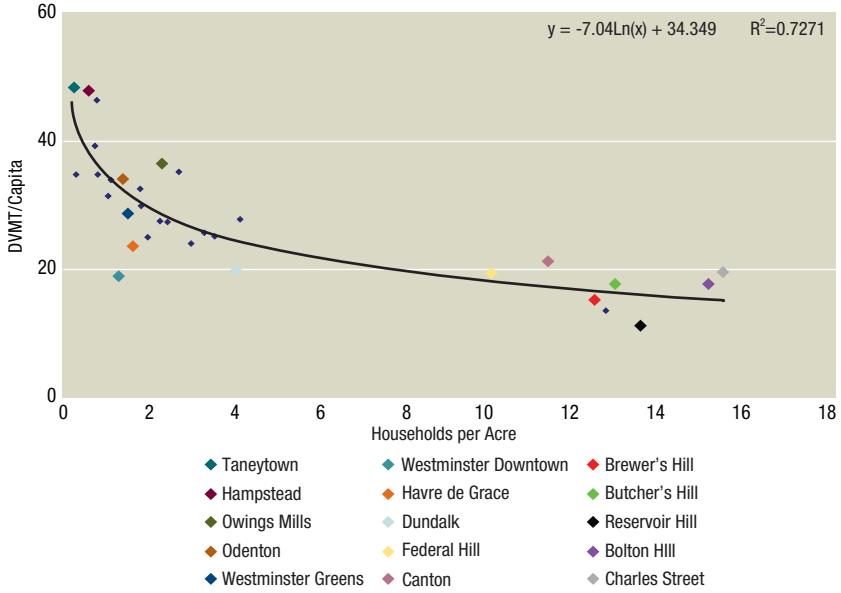
County	Draft Baseline	RTP04 Update	Workshop	Envision	Draft Policy
Imperial	133,000	116,000	131,000	132,000	132,000
Los Angeles	5,041,000	5,053,000	5,134,000	5,091,000	5,091,000
Orange	1,982,000	2,107,000	2,021,000	2,004,000	1,991,000
Riverside	1,414,000	1,296,000	1,334,000	1,371,000	1,387,000
San Bernardino	1,255,000	1,254,000	1,212,000	1,220,000	1,220,000
Ventura	463,000	461,000	455,000	468,000	466,000
SCAG Region	10,287,000	10,287,000	10,287,000	10,287,000	10,287,000

Appendix C - 4Ds Land Use/ Transportation Model Analysis

ESTIMATING THE TRAVEL BENEFITS OF THE PLAN ALTERNATIVE LAND USE CONCEPTS

Ample research has suggested that patterns of development, planned in a synergistic way with the transportation system, can have a fairly dramatic effect on travel behavior and vehicle miles traveled[2,3]. Empirical data gathered in travel surveys show that households that live in more urban settings tend to own fewer vehicles and generate considerably less vehicle travel and VMT than their counterparts in the suburbs. While the characteristics differentiating these two environments are many, even a simple proxy like residential density shows a very strong relationship with travel propensity, such as reflected in Figure C1 below.

FIGURE C1 DAILY PER CAPITA VMT BY RESIDENTIAL DENSITY



Source:

There are a variety of reasons why this occurs. In urban settings, residents have more opportunity to commute to work by transit or some other means than driving alone, given that transit service is probably more frequent and easier to access at the destination end. And if the work destination is also located in an urban setting, chances are that employee parking is not free, and that the nearness of other activities within walking distance of the workplace reduces the need to have a car for workday travel.

Perhaps more important is the nature of land use at the residential end. Whereas urban households are more likely to have an abundance of service, shopping, educational, entertainment and even social opportunities within a short distance from home, the suburban household located in a typical subdivision must travel considerable distances to satisfy these activities. Moreover, while the urban household can efficiently reach these "non work-related" activities by walking, biking or a short vehicle trip, the suburban household typically cannot walk either because of the distances, the separation of activi-

[2] Kuzmyak, J.R., R.H. Pratt, and B.G. Douglas. **TCRP Report 95: Traveler Response to Transportation System Changes**, Chapter 15. Land Use and Site Design. Transit Cooperative Research Program, Transportation Research Board, Washington DC (2003).

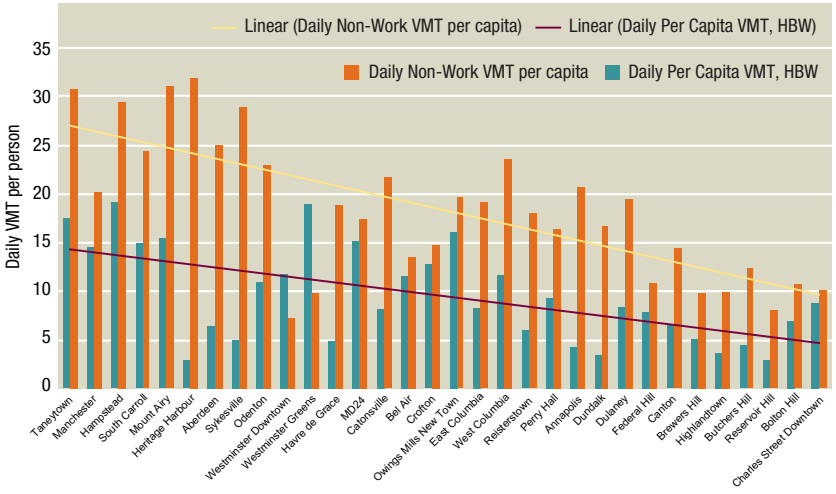
[3] Ross, C.L. and A.E. Dunning. **Land Use Transportation Interaction: An Examination of the 1995 NPTS Data.** Georgia Institute of Technology for Federal Highway Administration, US Dept. of Transportation. (Oct. 1997).

ties, a lack of sidewalks or crossing facilities, and a transportation system comprised of curvilinear streets and numerous cul-de-sacs. In short, the suburban household has little choice but to drive to meet all of its activity needs.

The National Household Travel Survey has repeatedly shown that the vast majority of household travel is for non-work purposes. In the 2001 survey, it was found that 45% of daily household person trips are for shopping or errands, 27% are for social or recreational purposes, and only 15% of trips are for commuting[4]. Of course, not all commuting trips are direct journeys from home to a work site and back home, but often include side trips for convenience or necessity.

Sightly more than one quarter, 27%, of workers in the 2001 survey engaged in such trip "chains"[5]. Due to this grouping, as well as the fact that the commute trips is typically the longest trip made by the household, the net effect is that commuting accounts for about 25% of household VMT, while it is only 15% of all trips. Still, the point is that non-work travel is the primary source of household VMT, and this relationship is closely tied to land use, as illustrated in Figure C2, also developed from the same Baltimore travel survey data:

FIGURE C2 DAILY WORK AND NON-WORK VMT PER CAPITA



Source:

The locations in the chart are again ordered in terms of residential density, from highest density (most urban) sites on the right to lowest density (most suburban) on the left. Pictured in adjoining bars are daily per capita VMT separated into work (HBW) and non-work totals.

Despite imprecision with how trips are "coded" by purpose in the travel modeling field (work trip chains often include non-work trips), a fairly clear trend can be seen in how non-work VMT is greater than and increases faster than work VMT as household location shifts from urban to suburban setting. And it should be studiously noted that the trend toward higher VMT rates in suburban areas is not substantially explained by income. The correlation between income and VMT rate for this sample is only 0.281, suggesting that factors other than income are influencing travel behavior.

In an attempt to quantify the characteristics of an environment that might explain why travel behavior might be different in an urban vs. a suburban setting, researchers proposed a framework consisting of the "3Ds" – Density, Diversity and Design.

[4] http://www.bts.gov/papers/national_household_travel_survey

[5] ***Our Nation's Travel: Current Issues.*** 2001 National Household Travel Survey, Federal Highway Administration, US Dept. of Transportation, Publication No. FHWA-PL-05-015.

- Density refers to the general concentration and proximity of activities, and can apply to either residential or employment density.
- Diversity refers to the degree to which different land use activities are intermingled, or "mixed", as well as the balance of that mix.
- Design describes the way in which it is all packaged, in terms of attractiveness, functionality and connectivity to pedestrians.

Researchers such as Cervero[6], Ewing[7] and Kockelman[8] have attempted various ways to quantify these attributes. An important qualification in doing so is recognition that these characteristics tend to take shape at a fairly micro level. In transportation modeling terms, this means at a level of spatial resolution smaller than a traffic analysis zone (TAZ), which is the basic unit of analysis in conventional 4-step regional travel forecasting models. The size of a typical TAZ is much larger than spatial units that describe such land use characteristics as walkability, mix and balance.

To differentiate such settings it is necessary to measure land use differences at a parcel or raster (grid cell) level, and local opportunities and walkability in relation to walkable distance around a household or transit station. The advancement and proliferation of GIS tools and compatible data base layouts make it increasingly possible to create such measures for planning purposes. Yet, what remains is the incompatibility of using measures that distinguish environmental and behavioral differences within a TAZ in a conventional travel forecasting model where the TAZ is the finest level of detail.

The US Environmental Protection Agency (EPA) attempted to make available a tool for use by planners in designing compact, mixed-use communities and activity centers, resulting in the Smart Growth Index (SGI) Model[9]. This model is GIS-based, which allows the user to "create" land use plans from parcels, lines and polygons, and then develop numerous measures from the raw inputs, including the 3Ds. Density in the SGI model is defined as households per acre, Diversity is defined by jobs/housing ratio, and Design is represented by a Pedestrian Environment Factor (PEF). This model has been used in numerous transportation and air quality applications, including the Atlantic Steel project in Atlanta[10] and efforts to develop a "Smart Growth SIP" for Baltimore in conjunction with the massive Digital Harbor infill and redevelopment proposal for inner city Baltimore.

APPLICATION TO THE SCAG REGION

Various perceived shortcomings in the SGI model argued against its use in the Plan Alternative analysis. First, the 3Ds measures themselves were not viewed as sufficient for characteristics like Diversity and Design. Second, the elasticities for all 3Ds variables were small in comparison to those seen in other research studies, which would otherwise minimize the potential impacts of the Plan Alternative. Third, the Index model operates as a pivot point procedure, which was also seen as a potential minimization of impacts. And fourth, the measure of regional transit accessibility, viewed as being a critical variable, was treated very simplistically in the model (its elasticity only engaged [0 or 1 dummy] if the analysis site was on a transit line).

The importance of regional transit accessibility in the SGI model makes it the "4th D" in the family of land use variables. Modeling efforts by Kockelman[11] and others included a measure of regional transit accessibility directly in models of linking auto ownership or travel behavior with land use. That impor-

[6] Cervero, Robert. **America's Suburban Centers: The Land Use-Transportation Link.** Boston: Unwin-Hyman, 1989.

[7] Ewing, R. and R. Cervero. Travel and the Built Environment – A Synthesis. In Transportation Research Record: Journal of the Transportation Research Board, No. 1780, TRB, National Research Council, Washington, D.C., 2001.

[8] Kockelman, K.M., "Travel Behavior as a Function of Accessibility, Land Use Mixing and Land Use Balance – Evidence from the San Francisco Bay Area." Transportation Research Record 1364 (1997).

[9] Criterion Planners & Engineers. Smart Growth INDEX®: A Sketch Tool for Community Planning. User Notebook, prepared for US Environmental Protection Agency, Washington D.C., 2002.

[10] "EPA Announces Approval of the Atlantic Steel Transportation Control Measure Into the Georgia State Implementation Plan", www.epa.gov/projctxl/atlantic/index.htm (08/24/2000).

[11] Kockelman, Kara. Travel Behavior as a Function of Accessibility, Land Use Mixing, and Land Use Balance: Evidence from the San Francisco Bay Area. Master's thesis, Department of City and Regional Planning, University of California at Berkeley, 1996.

tance also explains why it was a primary factor considered in the framework for the SCAG Plan Alternative analysis. Because the Plan Alternative entails a substantial focusing of future development in activity centers, around new and existing transit stations, and in corridors, regional transit accessibility was seen as critical design factor in gauging its benefits.

SCAG's approach was similar to recent modeling research performed for the Baltimore Metropolitan Planning Organization. In that research, a set of regression models for predicting both auto ownership and household VMT production were developed using data from a recent regional household travel survey, supplemented by measures of the 4Ds developed using the agency's GIS tools. The research objective was to attempt to replicate Kockleman's 1996 thesis work with Baltimore data, but in the process a new and more powerful measure was also discovered – a walk opportunities index. This index combines information on the type and location of non-residential activities (identified by SIC code), and using GIS, determines the walk access to those activities lying within ¼ mile of a household. When teamed with measures for mix (Entropy) and regional transit accessibility, robust models of auto ownership and household VMT were developed through multiple regression estimation. The results of this research are published in Transportation Research Record No. 1977[12].

SCAG initiated a post-processor approach using a similar set of models to those developed in Baltimore, using comparable data from the region. These models of auto ownership and household VMT were sensitive to both local land use differences, as well as regional transit accessibility. The procedure was to apply the models to individual TAZs in the 2035 Baseline and the Plan scenarios. Then, by comparing calculated VMT rates for the two cases, compute an adjustment factor to reduce VMT in the Plan scenario to reflect the changes in land use.

To take account of the major changes in population, employment and transportation system investments, the SCAG regional model was used to perform the initial analysis of the changes in regional travel and VMT for each macro scenario (Baseline and the various alternatives). Then, since the SCAG regional model was (as with all 4-step models) insensitive to land use features below the aggregation level of the TAZ, the 4Ds model was used to estimate the incremental benefit attributable to local land use. To address concerns about potential "double-counting" of benefits, an assumption was made that the regional model would reflect travel changes primarily due to commuting (inter-zonal longer distance trips, where transit is a growing option), while the 4Ds model would address primarily non-work travel changes. Indeed, data obtained by SCAG for the South Bay Cities subregion[13] found that a high percentage of non-work trips made by residents of mixed-use centers were made to the local center (on the order of 60 to 80%), and that a high percentage of these trips were made by walking or bicycle (43 to 72%). At the same time, most of these residents worked some distance from home (>90%) and were most likely to have driven alone to work (90+%) and to have taken advantage of free parking at the employment site (90+%).

The new models of vehicle ownership and household VMT estimated with data from the SCAG region are illustrated in Table C1. The vehicle ownership model explains the number of vehicles owned by a household as an increasing function of household size and annual income, and as an inverse function of the "land use variables" regional transit accessibility, land use mix, and walk opportunities. In other words, households own fewer vehicles when the land use variables have higher values. Household VMT is calculated as an increasing function of household size, number of workers, income and number of vehicles – which is input from the previous model. VMT declines in proportion to transit accessibility and walk opportunities, as land use mix is not significant in this model. Home-based work (HBW) VMT is also an independent variable in this model, used as a placeholder for what may be very different behavior for work travel than for non work. It should be noted that both equations carry respectable R^2 values for this type of data, and all

[12] Kuzmyak, J.R., C. Baber and D. Savory. "Use of a Walk Opportunities Index to Quantify Local Accessibility". *Transportation Research Record 1977* (2006).

[13] Solimar Research Group. "Mixed-Use Centers in the South Bay: How Do They Function and Do They Change Travel Demand?" A report to the Southern California Association of Governments and South Bay Cities Council of Governments (June 2005)

estimated coefficients are significant at the 95% confidence level (t-statistics in brackets).

TABLE C1 SCAG VEHICLE OWNERSHIP AND HOUSEHOLD VMT MODELS WITH 4DS SENSITIVITY

	Vehicles per Household			Daily Household Driver VMT		
	Coeff	Mean	Elasticity	Coeff	Mean	Elasticity
Constant	0.812			1.596		
HH Size	0.235 [38.65]	2.459	0.286	0.0415 [5.28]	2.642	0.109
Workers				0.0315 [1.86]	1.60	0.05
Income	0.166 [35.80]	4.56	0.375	0.0605 [10.13]	4.834	0.293
Vehicles		2.01		0.1032 [8.37]	2.04	0.211
Reg ACC TR	-0.000001 [-5.267]	46457	-0.023	-0.000001 [-3.93]	47428	-0.0474
LU Mix	-0.154 [-3.06]	0.259	-0.020			
Ln Walk Opp	-0.0334 [-5.27]	4.848	-0.017	-0.0278 [-3.83]	4.848	-0.1336
Ln HBW VMT				0.5322 [66.02]	3.446	0.833
R-squared	0.261			0.507		
# Obs	9,407			5,926		

The variables are described as follows:

- HH Size: Total number of persons residing in the household
- Workers: Number of household members who are employed full time
- Income: Annual household income (in $5k categories)
- Vehicles: Number of motorized vehicles owned by the household
- Reg Acc TR: Regional transit accessibility, calculated as the summation of the number of jobs available in each TAZ divided by the peak hour transit travel time to that zone.
- LU Mix: Land use mix, calculated as a measure of Entropy (see figure 3 below)
- Walk Opp: Sum of non-residential opportunities within ¼ mile walk-shed of household, weighted by their value and discounted by the walk distance from home (see Figure C4)

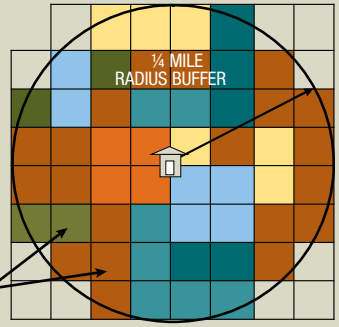
It should be noted that the Walk Opportunities Index is used in the natural log form in both models due to its non-linearity with the dependent variable, and both Household VMT and HBW VMT are used in natural log form also due to a non-linear distribution in the population.

FIGURE C3 CALCULATION OF LAND USE MIX (USING ENTROPY RELATIONSHIP)

$$Entropy = -\sum_j \frac{(P_j \times \ln(P_j))}{\ln(J)}$$

Where Pj = proportion of land in the Jth use type. The index varies from 0 to 1, with 1 denoting ideal balance (all distinct land uses occur in equal proportions)

SCAG's Land Use data at parcel level -- not necessary to create cells with average land use



Source

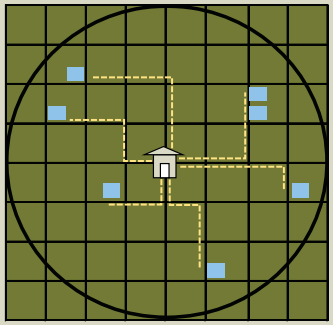
FIGURE C4 CALCULATION OF WALK OPPORTUNITIES INDEX

$$Opportunities = \sum \frac{W_i}{D_{ij}}$$

Where:

W_i is the value of an opportunity within walking distance (1/4 mile) of the household (values range from -1 to +1);

D_{ij} is the walk distance from the household to the opportunity using the street grid



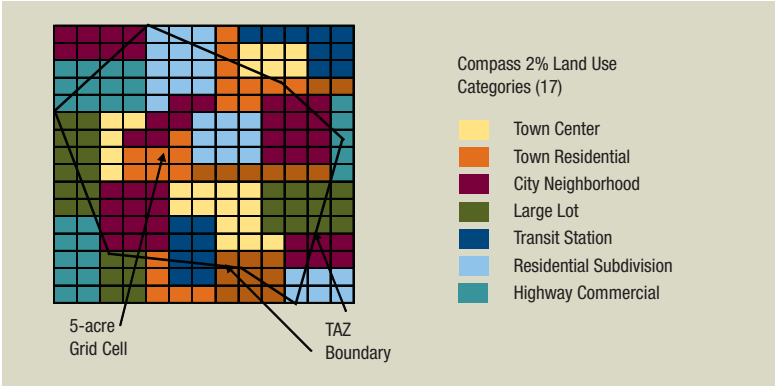
Source:

Also shown in Table C1 with the models and coefficient values is the mean value of the variable in the source data, and the point elasticity (percent change in the dependent variable caused by a 1% change in the independent variable) calculated at the mean for each independent variable. The elasticities reflect the relative value or importance of each variable, and as might be expected, the socio-demographic variables have the largest elasticities. The transit access and land use variables have smaller elasticities, but it should be noted that the degree of change that would be expected in these variables due to the Plan Alternative is likely to be proportionately much greater than for the socio-demographic variables. These elasticity ranges are very comparable to those discovered in the previously noted Kockelman and Kuzmyak/BMC research.

The vehicle ownership and household VMT regression models were developed from travel survey data taken from SCAG's 2001 regional household travel survey. The household was the unit of observation used in estimating the model, which allowed exact placement of the household in relation to current land use and transportation offerings. While the regional travel model was used to generate travel times and the corresponding measure of transit accessibility, the estimated models were disaggregate household models.

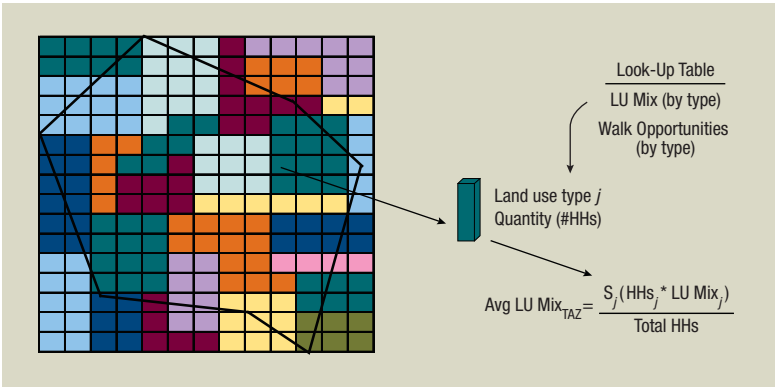
In application, it was necessary to apply the models to zone level data in order to interface with the SCAG regional model outputs. This entailed calculating the values of the land use variables for individual traffic zones. As explained earlier in the description of the Envision process, the changes to the composition of land use associated with the Plan are communicated through a system of 17 different land use definitions applied at the level of 5-acre grid cells. Figure C5 characterizes how this patterning is presented for a hypothetical TAZ.

FIGURE C5 ILLUSTRATION OF CORRESPONDENCE BETWEEN PLAN ALTERNATIVE LAND USE GRID CELLS AND SCAG TRAFFIC ANALYSIS ZONE



To ascertain the "average" land use characteristics of a TAZ, the values for Land Use Mix and Walk Opportunities for individual grid cells were weighted by the number of households in each grid cell experiencing those conditions. This process is illustrated below in Figure C6.

FIGURE C6 WEIGHTING OF CHARACTERISTICS BY GRID CELL HOUSEHOLDS



Ascertaining the values for the individual grid cells associated with each Plan Alternative land use definition also required some simplifying assumptions. Lacking precise information on the composition of each grid cell in 2035, default values for Land Use Mix and Walk Opportunities were developed for each of the 17 land use types. This was done by first looking at the composition of land use types in each of the classes, as illustrated in Table 2. Fairly detailed portrayals of land use types, e.g., single-family vs. multi-family/condominium designations, were collapsed into three key generic categories: Residential, Employment, and Retail/Service. The regression models were not sensitive to these fine definitions, and they simply confounded the calculation of the LU Mix by trying to account for a larger number of categories than were actually relevant. Using the earlier entropy equation, the default LU Mix values in the table were calculated from the shown proportions. Obviously, places with no land use diversity such as Residential Subdivision, have Land Use Mix values of zero, whereas places with not only good mix but also good balance, such as City Center, have values approaching the upper limit of 1.0.

The value for Walk Opportunities (shown in the table as Wtd Opp because it is a weighted, travel impedance-discounted sum of opportunities) has been approximated using information on the mix of activities in the given land use category (particularly the presence of retail in some reasonable proportion to residential base) and the range of the Walk Opportunities variable seen in the base data. In the base data, values were seen to range from zero to 10,824, with a mean of 121. It was judged that the best Plan Scenario categories would have values approximating the high end of the empirical range, i.e., 8,000 to 10,000, while one-dimensional land use types such as Residential Subdivision have no walk opportunities, and places such as Highway Commercial may have opportunities, but no walkability to reach them, thus low values.

TABLE C2 CALCULATION OF DEFAULT VALUES FOR LAND USE VARIABLES FOR PLAN ALTERNATIVE LAND USE CATEGORIES

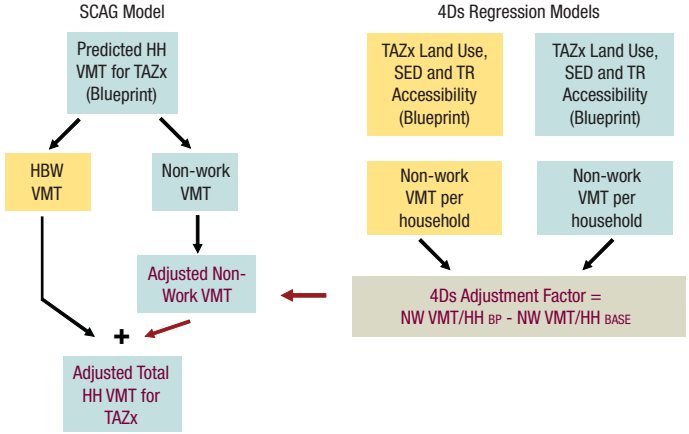
Dev type	Resid	Empl	Ret/Svc	LU Mix	Wtd Opp	HH VMT	% Red
Downtown Center	8%	75%	17%	0.655	5000	43.79	-10.9%
Downtown Res	57%	0%	43%	0.622	10000	42.97	-12.5%
City Center	38%	24%	38%	0.981	8000	43.00	-12.5%
City Res	72%	5%	23%	0.659	6000	43.56	-11.3%
Town Center	60%	20%	20%	0.865	6000	43.42	-11.6%
Town Res	95%	0%	5%	0.181	500	47.09	-4.2%
City Neighborhood	95%	0%	5%	0.181	500	47.09	-4.2%
Residential Sub	100%	0%	0%	0.000	0	54.94	11.8%
Large Lot	100%	0%	0%	0.000	0	54.94	11.8%
Rural Cluster	100%	0%	0%	0.000	0	54.94	11.8%
Activity Center	35%	50%	15%	0.909	5000	43.62	-11.2%
Transit Station	80%	4%	16%	0.547	5000	43.87	-10.7%
Transit Corridor	87%	0%	13%	0.352	2000	45.16	-8.1%
Main Street	60%	0%	40%	0.613	8000	43.24	-12.0%
Office Park	0%	100%	0%	0.000	0	54.94	11.8%
Industrial	0%	100%	0%	0.000	0	54.94	11.8%
Highway Commercial	45%	0%	55%	0.048	500	47.19	-3.9%

	Min	Max	Mean
Wtd Opp	0	10524	121
LU Mix	0	0.821	0.269
HH VMT			49.13

The process for applying the 4Ds post-processor approach to estimate the travel benefits attributable to the Plan Scenario is illustrated in Figure C7. First, the SCAG regional model is run on the future conditions for 2035 associated with both the Baseline (no explicit, strategic changes to land use patterns) and the respective Plan Scenario. SCAG's objective is to show how the Plan Scenario leads to reductions in non-work VMT. The first step is to split the model-estimated VMT for the Plan Scenario into work (HBW) and non-work components (by multiplying person trips for the TAZ in the respective trip table by the associated O/D skim distances). Then the 4Ds regression models are used to calculate HH non-work VMT rates for the Plan Scenario and for the Baseline scenario. The ratio of these two rates constitutes the 4ds Adjustment Factor that is then used to reduce the non-work VMT estimate from the SCAG model run. The HBW and non-work VMTs are then recombined into a total VMT for the zone, reflecting the full impact of the Plan Scenario.

By doing this procedure across all zones, incremental benefits associated with the Plan Scenario can be estimated for each county, the region, or any subset of zones that is desired to compare (e.g., Plan vs. non). The final step is relating the zonal VMT changes back to the trip tables and highway link assignments to enable congestion and air quality analyses.

FIGURE C7 PROCEDURE FOR ADJUSTING SCAG MODEL OUTPUT TO REFLECT PLAN SCENARIO EFFECTS



PERFORMANCE

4DS ANALYSIS

SCAG's post-processing approach was devised to create sub-models of auto ownership and household VMT that were sensitive to both demographic factors and the 4Ds. These models were estimated using multiple regression analysis and data compiled from SCAG's 2001 regional travel survey and information from both the regional model and associated land use databases. These 4Ds regression models were subsequently applied to individual TAZs in the Baseline and the Plan scenarios. The ratio of the VMT rates between the Plan Alternative and the Baseline constitutes a "VMT reduction factor" which is then applied to the first stage regional model estimate of Plan VMT for the respective zone to account for the additional benefits of the 4Ds.

The equations used to compute the 4Ds impacts on vehicle ownership and VMT are displayed in Table C1. A critical assumption in combining the application of the 4Ds models with the SCAG regional model is that the latter is most adept at reflecting regional effects of jobs and housing location at the TAZ level, and accessibility afforded by the regional highway and transit sys-

TABLE C3 ADDITIONAL VMT REDUCTIONS FOR PLAN SCENARIO DUE TO 4DS LAND USE STRATEGIES

County	Total VMT Plan	HBW VMT Plan	Non-Work VMT Plan	Adjusted Plan Non-Work VMT	Adjusted Plan Total VMT	Net VMT Reduction	Pct. Red.
Imperial	3,377,291	1,219,673	2,157,618	2,088,257	3,307,930	69,361	2.1%
Los Angeles	175,821,249	69,149,395	106,671,854	104,792,685	173,942,081	1,879,168	1.1%
Orange	59,101,838	24,489,851	34,611,987	33,067,007	57,556,858	1,544,980	2.6%
Riverside	58,459,626	20,431,800	38,027,825	36,061,209	56,493,009	1,966,616	3.4%
San Bernardino	51,066,497	18,266,498	32,799,999	30,201,782	48,468,281	2,598,217	5.1%
Ventura	15,940,397	6,456,840	9,483,557	8,938,953	15,395,793	544,604	3.4%
Region	363,766,897	140,014,058	223,752,840	215,149,893	355,163,951	8,602,947	2.4%

tems. This assumption allows us to presume that the regional model's estimate of travel effects will be most robust for interzonal and primarily work-based travel, while the 4Ds models will reflect intrazonal, and primarily non-work travel. To avoid potential double counting, the 4Ds VMT model was further specified to include as an independent variable the amount of home based work (HBW) travel generated by the household. Hence, the Household VMT predicted is essentially non-work.

TABLE C3 SCAG VEHICLE OWNERSHIP AND HOUSEHOLD VMT MODELS WITH 4DS SENSITIVITY

	Vehicles per Household			Daily Household Driver VMT		
	Coeff	Mean	Elasticity	Coeff	Mean	Elasticity
Constant	0.812			1.596		
HH Size	0.235 [38.65]	2.459	0.286	0.0415 [5.28]	2.642	0.109
Workers				0.0315 [1.86]	1.60	0.05
Income	0.166 [35.80]	4.56	0.375	0.0605 [10.13]	4.834	0.293
Vehicles		2.01		0.1032 [8.37]	2.04	0.211
Reg ACC TR	-0.000001 [-5.267]	46457	-0.023	-0.000001 [-3.93]	47428	-0.0474
LU Mix	-0.154 [-3.06]	0.259	-0.020			
Ln Walk Opp	-0.0334 [-5.27]	4.848	-0.017	-0.0278 [-3.83]	4.848	-0.1336
Ln HBW VMT				0.5322 [66.02]	3.446	0.833
R-squared	0.261			0.507		
# Obs	9,407			5,926		

Where:

HH Size: Total number of persons residing in the household;

Workers: Number of household members who are employed full time;

Income: Annual household income (in $5k categories);

Vehicles: Number of motorized vehicles owned by the household;

Reg Acc TR: Regional transit accessibility, calculated as the summation of the number of jobs available in each TAZ divided by the peak hour transit travel time to that zone.

LU Mix: Land use mix, calculated as a measure of Entropy that measures the relative proportions P of land uses in J different land use types.

$$Entropy = -\sum_j \frac{(P_j \times \ln(P_j)}{\ln(J)}$$

Walk Opp: Sum of non-residential opportunities W within ¼ mile walkshed of household, weighted by their value and discounted by the walk distance D from home.

$$\text{Opportunities} = \Sigma\ W_i\ /\ D_{ij}$$

As noted previously, the Walk Opportunities Index is used in the natural log form in both models due to its non-linearity with the dependent variable, and both Household VMT and HBW VMT are used in natural log form also due to a non-linear distribution in the population.

The process for making the 4Ds adjustment is shown in Figure C1. First, the SCAG regional model is run on the future conditions for 2035 associated with both the Baseline (where there have been no strategic changes to land use patterns) and the respective Plan Alternative scenario (in this case, "Plan"). Since the approach is to relate intrazonal 4Ds land use to production of non-work VMT, first the SCAG model-estimated VMT for the Plan Alternative is split into work (HBW) and non-work components. This estimate of zonal VMT is obtained by multiplying person trips for the TAZ in the respective trip table by the associated travel distances in the O/D skim matrices. Then the 4Ds regression models are used to calculate HH non-work VMT rates for the Plan Alternative condition and for the Baseline condition. The ratio of these two rates constitutes the 4Ds Adjustment Factor that is then used to reduce the non-work VMT estimate from the SCAG model run. The HBW and non-work VMT are then recombined into a total VMT for the zone, reflecting the full impact of the Plan Alternative, including the 4Ds.

By following this procedure described in Figure 7 across all zones, incremental benefits associated with the Plan Alternative can be estimated for each county, the region, or any subset of zones that may be used to describe a geographic area of policy interest. The results of this application for the region and the individual counties as applied to the Plan scenario are shown in Table 4 below.

Total Plan VMT for each zone is determined from the SCAG model using the procedure described below, along with the proportions that are estimated to be work-related (HBW) and non-work. Then for each zone, VMT is calculated using the 4Ds regression models, first for the Baseline land use and household allocation and then for the Plan. The two VMT estimates are compared, and the ratio becomes the 4Ds VMT adjustment factor. This factor is applied to the non-work VMT estimate from the travel model and results in an Adjusted Plan Non-Work VMT, shown in column four. This is recombined with the HBW VMT (which is not adjusted for 4Ds) to yield an adjusted total Plan VMT for the zone. The net VMT savings is shown in "Net VMT Reduction", followed by a measure of its percent reduction relative to the starting VMT ("Total VMT Plan").

Although the results are calculated by TAZ, they are summarized by county. Table C5 suggests that the 4Ds are capable of reducing an additional 8.6 million daily VMT region-wide over what has already been calculated through the SCAG model, ranging from a high of 1.96 million in Riverside

County to a low of 0.69 million in Imperial. Los Angeles, by far the largest county, achieves an additional reduction due to 4Ds of 1.88 million VMT per day.

"Total VMT Plan" shows the total VMT estimated at the TAZ level from the SCAG model results for the Plan scenario. It is obtained by multiplying the OD trip table for each TAZ by its respective OD travel distance from a companion "skim" matrix. It should be noted that when TAZ VMT is approximated in this fashion, the county-level results may be very different from what is calculated at the county level by the SCAG model. The reason for this is that county VMT from the SCAG model is a summation of all vehicle trips assigned to the respective links of the highway system in the given county. This link-based summary includes trips that were neither generated by households in the respective zone, or which have neither an origin nor destination in the county. The difference between the link-based totals of VMT by county and those produced by our synthetic method based on households may be seen in the following table:

TABLE C5 COMPARISON OF COUNTY VMT TOTALS FOR PLAN SCENARIO FROM SCAG MODEL VS. APPROXIMATION METHOD USING HOUSEHOLDS

County	Model Plan VMT	Approx Total VMT	Difference	Pct Difference
Imperial	10,060,021	3,377,291	6,682,731	66.4%
Los Angeles	236,499,617	175,821,249	60,678,368	25.7%
Orange	80,410,177	59,101,838	21,308,339	26.5%
Riverside	67,041,537	58,459,626	8,581,912	12.8%
San Bernardino	77,884,628	51,066,497	26,818,131	34.4%
Ventura	21,408,182	15,940,397	5,467,785	25.5%
Regional	493,304,163	363,766,897	129,537,265	26.3%

The differences between county VMT totals based on method of estimation range from a high of 66.4% in Imperial County to a low of 12.8% in Riverside County, with an average of 26.3% for the region as a whole. While this difference may appear problematic, there is really not an alternative given the nature of the post-processing methodology that is keyed to household VMT adjustment. Its discrepancies, however, cause the methodology to err on the conservative side, since it systematically underestimates the base of VMT to which the 4Ds adjustments are applied, and uses the absolute value of the VMT reduction rather than a percentage.

Table 6 offers insight to the nature of the calculated VMT reductions due to 4Ds. It indicates, for each county, the number of TAZs in which households were added between the Baseline and Plan to take advantage of improved land use, as well as the number of cases where TAZs had households reduced. Overall for the region, households were added to 1,344 zones and removed from 2,654 zones between the Baseline and Plan, with a total of about 896,000 households in play. Households were not shifted in only 111 of the region's 4,109 zones.

The VMT Adjustment Factor is the number obtained through the above-described application of the 4Ds regression models to Baseline and Plan land use characteristics. This is the number that reflects the efficiency of the Plan zone's land use over the Baseline's, with a value less than 1.0 signifying an improvement (reflected in a lower VMT rate) and more than 1.0 as a worsening of land use. Since the objective of the Plan Alternative scenario was to move more households into zones with improved land use and out of zones with less effective land use, this process was successful.

The average VMT reduction factor for TAZs receiving an addition of households ranged from 0.875 for Riverside County to 0.9315 for LA County. Meanwhile, the reduction factors for those TAZs where households were removed ranged from 0.9704 in Orange County to a high of 1.0091 in Riverside. Overall, households were moved from higher VMT generating areas to TAZs with better characteristics due to transit and land use. The move of household into better TAZs resulted in a regional savings in daily VMT of 8.6 million, but what is also interesting to note is that overall improvements associated with the Plan scenario even improved conditions in many of those zones from which households were taken. In this latter instance, removing households from TAZs with high VMT rates (VMT adjustment factor >1.0) resulted in a

VMT savings, as did savings passed on to households remaining in TAZs where households had been shifted out (or held constant), but the VMT adjustment factor was less than 1.0.

It is particularly interesting to note that the VMT adjustment rates for Los Angeles County appear to be among the least favorable in the region, despite the fact that it is probably the most "urban" county in the region and is receiving the biggest investments in transit. Its average VMT adjustment factor is only 0.98, and its factor for zones where households were added is only 0.9315. The reason for this is probably that in spite of being the object of major enhancements under the Plan scenario, it is starting at a higher base level than the other counties. Since the 4Ds VMT adjustment factor is based on relative change compared to the Baseline, this higher starting level in Los Angeles County would result in more subdued 4Ds reduction factors.

TABLE C6 COMPARISON OF HOUSEHOLD REALLOCATIONS ACROSS COUNTIES AND TAZS, PLAN VS. BASELINE AND RELATIONSHIP TO VMT REDUCTION FROM 4DS

County	SED Plan vs Base	No. TAZs	HHs Baseline	HHs Plan	Change HHs	Avg VMT Adj Factor	Avg VMT Red	Total VMT Red
Imperial	HHs Added	27	14,492	36,039	21,547	0.9109	2,258	60,975
	No Change	1	14	14	0	1.0030	-1	-4
	HHs Removed	82	88,370	64,711	-23,659	0.9967	102	8,388
	Total	110	102,876	100,764	-2,112	0.9757	631	69,361
Los Angeles	HHs Added	784	1,297,534	1,700,514	402,980	0.9315	3,940	3,088,952
	No Change	21	1,882	1,882	0	1.0128	20	411
	HHs Removed	1438	2,701,861	2,382,780	-319,081	1.0064	-842	-1,210,192
	Total	2243	4,001,277	4,085,176	83,899	0.9803	838	1,879,163
Orange	HHs Added	129	206,474	264,488	58,014	0.9053	6,211	801,251
	No Change	51	30,167	30,167	0	0.9778	509	25,971
	HHs Removed	486	881,852	838,909	-42,943	0.9704	1,477	717,759
	Total	666	1,118,493	1,133,564	15,071	0.9583	2,320	1,544,980
Riverside	HHs Added	161	288,123	518,689	230,566	0.8750	14,192	2,284,957
	No Change	5	0	0	0	1.0000	0	0
	HHs Removed	312	894,976	622,861	-272,115	1.0091	-1,020	-318,340
	Total	478	1,183,099	1,141,550	-41,549	0.9639	4,114	1,966,616
San Bernardino	HHs Added	173	328,320	476,937	148,617	0.9196	11,221	1,941,181
	No Change	7	47	47	0	0.9086	56	395
	HHs Removed	222	644,200	436,771	-207,429	0.9632	2,958	656,640
	Total	402	972,567	913,755	-58,812	0.9435	6,463	2,598,218
Ventura	HHs Added	70	102,882	137,157	34,275	0.9072	5,260	368,169
	No Change	26	32,347	32,347	0	0.9772	980	25,482
	HHs Removed	114	194,963	164,516	-30,447	0.9799	1,324	150,953
	Total	210	330,192	334,020	3,828	0.9553	2,593	544,604
Entire Region	HHs Added	1344	2,237,825	3,133,824	3,133,824	0.9190	6,358	8,545,488
	No Change	111	64,457	64,457	64,457	0.9811	471	52,258
	HHs Removed	2654	5,406,222	4,510,548	4,510,548	0.9951	2	5,202
	Total	4109	7,708,504	7,708,829	7,708,504	0.9698	2,094	8,602,931

Appendix D - Development Types

The following describe the development types used in the scenario modeling process.

DOWNTOWN CENTER

HH/acre: 28
Emp/acre: 298

Modeled on downtown Los Angeles, the Downtown Center development type serves as a destination and employment center, incorporating retail, office, residential, and civic uses into a walkable and mixed-use environment. Building types range from mid-rise mixed use buildings to commercial towers. Interconnected street networks and a variety of amenities within walking distance make Downtown Centers accessible by automobile, transit, bicycle and foot. Civic and open spaces lend to the walkability and diversity of uses in Urban Centers. They are lively throughout the day and evening. This development type is especially apt for infill in downtown Los Angeles.

DOWNTOWN RESIDENTIAL

HH/acre: 110
Emp/acre: 18

The Downtown Residential development type contains an array of multi-family homes and townhouses arranged on a grid near dense downtown centers. Buildings range from mid-rise residential buildings to mixed-use residential high rises.

CITY CENTER

HH/acre: 26
Emp/acre: 82

The City Center development type incorporates a diverse mix of residential and employment uses, though at a lower density than the Urban Center. The City serves as a significant center for employment. Like Pasadena or Santa Monica, this development type serves as a walkable city core. It may require structured parking and is accessible via multiple modes of transportation.

CITY RESIDENTIAL

HH/acre: 44
Emp/acre: 19

The City Residential development type is characterized by a greater proportion and diversity of housing than Downtown Residential areas. Located close to city centers, these areas include multi-family homes, single-family homes and townhouses.

TOWN CENTER

HH/acre: 24
Emp/acre: 28

Town Centers primarily function as service destinations with a central Main Street rather than centers of employment. They feature a larger share of residential uses than Downtown and City Centers. They are walkable because of their mix of residential, retail, and office uses and interconnected street network, but at a lower density than Downtown and City Centers. Surface parking lots provide parking in Town Centers.

TOWN RESIDENTIAL

HH/acre: 24
Emp/acre: 2

Most homes in the Town Residential development type are detached single-family residences that are oriented towards the street, commercial areas and open space.

MAIN STREET

HH/acre: 16
Emp/acre: 17

Buildings on Main Streets typically stand two to four stories tall and include townhouses or apartments above storefronts. These areas are mixed-use and highly walkable.

TRANSIT STATION

HH/acre: 25
Emp/acre: 10

These are the areas directly surrounding light rail transit stops. Primarily residential in nature, buildings range from townhouses and duplexes to 10 story mixed use buildings with shopping on the ground floor. They are highly walkable areas that provide convenient access to transit for their residents.

TRANSIT CORRIDOR

HH/acre: 15
Emp/acre: 8

Transit Corridors are characterized by mixed-use, mid-rise development along bus or light rail corridors.

TOWN CENTER

HH/acre: 24
Emp/acre: 28

Town Centers primarily function as service destinations with a central Main Street rather than centers of employment. They feature a larger share of residential uses than Downtown and City Centers. They are walkable because of their mix of residential, retail, and office uses and interconnected street network, but at a lower density than Downtown and City Centers. Surface parking lots provide parking in Town Centers.

TOWN RESIDENTIAL

HH/acre: 24
Emp/acre: 2

Most homes in the Town Residential development type are detached single-family residences that are oriented towards the street, commercial areas and open space.

MAIN STREET

HH/acre: 16
Emp/acre: 17

Buildings on Main Streets typically stand two to four stories tall and include townhouses or apartments above storefronts. These areas are mixed-use and highly walkable.

TRANSIT STATION

HH/acre: 25
Emp/acre: 10

These are the areas directly surrounding light rail transit stops. Primarily residential in nature, buildings range from townhouses and duplexes to 10 story mixed use buildings with shopping on the ground floor. They are highly walkable areas that provide convenient access to transit for their residents.

TRANSIT CORRIDOR

HH/acre: 15
Emp/acre: 8

Transit Corridors are characterized by mixed-use, mid-rise development along bus or light rail corridors.

ACTIVITY CENTER

HH/acre: 22
Emp/acre: 29

An Activity Center is an agglomeration of large-scale retail buildings, offices and multi-family housing such as South Coast Plaza and Ontario Mills. The Activity Center development type contains a relatively dense mix of uses, comparable to a City. But, unlike the City, it is not pedestrian-friendly. Land uses are separated from each other by parking areas, freeways or arterials. Activity Centers are usually positioned at intersections of highways or arterials, sometimes along major transit corridors.

HIGHWAY COMMERCIAL

HH/acre: 6
Emp/acre: 8

This type is modeled after highway-oriented development. Like the Activity Center, it contains many residential units. But rather than being agglomerated at a highway intersection, Highway Commercial development takes a linear form along both sides of the highway. Connections in this development type consist mostly of highways and frontage roads. Housing is either in the form of multi-family apartments or residential subdivisions; both are typically auto-oriented.

OFFICE PARK

HH/acre: 0
Emp/acre: 39

Office Parks are comprised of low to medium density office buildings surrounding by surface parking. Generally located near highways for easy auto-access, Office Parks have limited transit and walking options. Office Parks lack residential or retail uses, thus increasing the number of auto trips needed.

INDUSTRIAL

HH/acre: 0
Emp/acre: 14

The Industrial development type is made up of a mix of low and medium density industrial buildings. They often consist of industrial yards and campuses separate from other uses due to the nature of industrial use. This development type is often near highways and accessed via automobiles with large surface parking for autos and trucks. Walking and transit options are severely limited.

CITY NEIGHBORHOOD

HH/acre: 9
Emp/acre: 1

City Neighborhoods are comprised of mid to low-rise multi-family, townhouses and small lot single-family dwellings. With the same number of residential units per acre as the Town development type, City Neighborhoods are medium-high density residential areas with a small number of service or office jobs. Street connectivity is favorable, allowing for a high degree of walkabililty and transit options.

RESIDENTIAL SUBDIVISION

HH/acre: 5
Emp/acre: 0

Residential Subdivisions are comprised of single-family, detached homes and duplexes. Street networks are typical of post -World War II suburbs. Residential Subdivisions are designed for automobile travel. Due to the extensive use of cul-de-sacs, street connectivity and walkability are generally low. Examples include Santa Clarita and parts of San Bernardino and Riverside County.

LARGE-LOT SUBDIVISION

HH/acre: 2
Emp/acre: 0

Large-Lot Subdivisions consist entirely of single-family, detached homes. This development type can be found in Orange and Ventura County as well as outlying areas. Large-Lot Subdivisions are typically isolated or far from employment and retail services. Averaging two units per acre, this development type is characterized by very large residences without sidewalks. Street connectivity is low and travel to and from the Large-Lot Subdivision development type is usually by automobile.

RURAL CLUSTER

HH/acre: 0.33
Emp/acre: 0

The Rural Cluster development type consists of estate lots that amount to one unit per five acres. Rural Cluster development provides residents with access to rural areas while being within reach of urban amenities. This development type consumes greater amounts of open space and tends to be farther from employment than Large-Lot Subdivisions. Street connectivity is also generally low among estate lots.